IB

Union Calendar No. 510

118TH CONGRESS
2D SESSION

H. R. 6213

[Report No. 118–612]

To reauthorize the National Quantum Initiative Act, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

NOVEMBER 3, 2023

Mr. LUCAS (for himself, Ms. LOFGREN, Mr. COLLINS, Ms. STEVENS, Mr. WILLIAMS of New York, Mr. BOWMAN, Mr. BABIN, Mr. SORENSEN, Mr. OBERNOLTE, Mrs. FOUSHEE, Mr. MILLER of Ohio, and Ms. ROSS) introduced the following bill; which was referred to the Committee on Science, Space, and Technology

JULY 25, 2024

Additional sponsors: Mr. WEBER of Texas, Mr. CASTEN, Mr. BAIRD, Mr. MULLIN, Mr. MIKE GARCIA of California, Ms. SALINAS, Ms. TENNEY, Mr. JACKSON of North Carolina, Mr. KEAN of New Jersey, Ms. BONAMICI, Mr. WITTMAN, Mr. FEENSTRA, Ms. LEE of Pennsylvania, Ms. CARAVEO, Mrs. SYKES, Mr. MORELLE, Mr. NEGUSE, Ms. NORTON, Mr. THANEDAR, Mr. THOMPSON of Pennsylvania, Ms. DELBENE, and Mr. ALLRED

JULY 25, 2024

Reported with an amendment, committed to the Committee of the Whole House on the State of the Union, and ordered to be printed

[Strike out all after the enacting clause and insert the part printed in italic]

[For text of introduced bill, see copy of bill as introduced on November 3, 2023]

A BILL

To reauthorize the National Quantum Initiative Act, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "National Quantum Initiative Reauthorization Act".

SEC. 2. DEFINITIONS.

Section 2 of the National Quantum Initiative Act (15 U.S.C. 8801) is amended—

(1) by redesignating paragraphs (4), (5), (6), (7), the first paragraph (8) (relating to the definition of the "Subcommittee on Economic and Security Implications"), and the second paragraph (8) (relating to the definition of the "Subcommittee on Quantum Information Science") as paragraphs (7), (9), (12), (13), (15), and (16), respectively;

(2) by inserting after paragraph (3) the following new paragraphs:

"(4) FEDERAL LABORATORY.—The term 'Federal laboratory' has the meaning given such term in section 4 of the Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. 3703).

"(5) FOREIGN COUNTRY OF CONCERN.—The term 'foreign country of concern' means—

"(A) a country that is a covered nation (as such term is defined in section 4872(d) of title 10, United States Code); and

"(B) any country that the Secretary of Commerce, in consultation with the Secretary of Defense, the Secretary of State, and the Director of National Intelligence, determines to be engaged in conduct that is detrimental to the national security or foreign policy of the United States.

"(6) FOREIGN ENTITY OF CONCERN.—The term 'foreign entity of concern' means a foreign entity that is—

"(A) designated as a foreign terrorist organization by the Secretary of State under section 219(a) of the Immigration and Nationality Act (8 U.S.C. 1189(a));

"(B) included on the list of specially designated nationals and blocked persons maintained by the Office of Foreign Assets Control of the Department of the Treasury (commonly known as the 'SDN list');

"(C) owned by, controlled by, or subject to the jurisdiction or direction of a government of a foreign country that is a covered nation (as

such term is defined in section 4872 of title 10, United States Code);

"(D) alleged by the Attorney General to have been involved in activities for which a conviction was obtained under—

"(i) chapter 37 of title 18, United States Code (commonly known as the 'Espionage Act');

"(ii) section 951 or 1030 of title 18, United States Code;

"(iii) chapter 90 of title 18, United States Code (commonly known as the 'Economic Espionage Act of 1996');

"(iv) the Arms Export Control Act (22 U.S.C. 2751 et seq.);

"(v) section 224, 225, 226, 227, or 236 of the Atomic Energy Act of 1954 (42 U.S.C. 2274, 2275, 2276, 2277, and 2284);

"(vi) the Export Control Reform Act of 2018 (50 U.S.C. 4801 et seq.); or

"(vii) the International Emergency Economic Powers Act (50 U.S.C. 1701 et seq.); or

"(E) determined by the Secretary of Commerce, in consultation with the Secretary of De-

fense and the Director of National Intelligence, to be engaged in unauthorized conduct that is detrimental to the national security or foreign policy of the United States.";

(3) in paragraph (7), as so redesignated, by striking "(a)" each place it appears;

(4) by inserting after paragraph (7), as so redesignated, the following new paragraph:

"(8) NATIONAL LABORATORY.—The term 'National Laboratory' has the meaning given such term in section 2 of the Energy Policy Act of 2005 (42 U.S.C. 15801).";

(5) by inserting after paragraph (9), as so redesignated, the following new paragraphs:

"(10) QUANTUM APPLICATIONS.—The term 'quantum applications' means applications that use quantum information science engineering and technology, including quantum algorithms and software, quantum computing and quantum-classical hybrids, quantum sensing, quantum networking, quantum encryption, or quantum communications applications.

"(11) QUANTUM COMPUTING.—The term 'quantum computing' means any of a variety of quantum computing technologies, including quantum annealing

and quantum gate-model systems that utilize a variety of qubit architectures, such as superconducting, ion traps, photonics, neutral atoms, spin atoms, or spin electrons.'';

(6) by amending paragraph (12), as so redesignated, to read as follows:

''(12) QUANTUM INFORMATION SCIENCE, TECHNOLOGY, AND ENGINEERING.—The term 'quantum information science, technology, and engineering' means the understanding, translation, use, or application of the laws of quantum physics for the storage, transmission, manipulation, computing, simulation, or measurement of information.''; and

(7) by inserting after paragraph (13), as so redesignated, the following new paragraph:

''(14) STEM.—The term 'STEM' means the academic and professional disciplines of science, technology, engineering, and mathematics, including computer science.''.

SEC. 3. PURPOSES.

Section 3 of the National Quantum Initiative Act (15 U.S.C. 8802) is amended—

(1) in the matter preceding paragraph (1), by striking ''science and its technology applications'' and inserting ''science, engineering, and technology'';

(2) in paragraph (1)—

(A) in the matter preceding subparagraph (A), by striking "science and technology" and inserting "science, engineering, and technology";

(B) by amending subparagraph (A) to read as follows:

"(A) to expand the number of researchers, educators, and students with training in quantum information science, engineering, and technology to develop a domestic workforce pipeline and retain international talent to the extent consistent with national security and international competitiveness;";

(C) in subparagraph (B), by striking "science at the" and inserting "science, engineering, and technology at the primary, secondary,";

(D) in subparagraph (C), by striking "basic";

(E) in subparagraph (D)—

(i) by striking "science and technology" and inserting "science, engineering, and technology"; and

(ii) by striking "and" after the semicolon; and

(F) by adding at the end the following new subparagraphs:

"(F) to support development of quantum applications, including quantum-hybrid applications, to promote innovation and commercialization; and

"(G) to support technologies, including artificial intelligence, that could benefit from or benefit the development of quantum technology and promote research, development, demonstration, and application of such technologies in quantum information science, engineering, and technology.";

(3) in paragraph (2), by striking "science and technology" and inserting "science, engineering, and technology";

(4) in paragraph (3), by striking "science and technology" and inserting "science, engineering, and technology";

(5) in paragraph (4)—

(A) by inserting "National Laboratories," after "Federal laboratories,"; and

(B) by striking "and" after the semicolon;

(6) in paragraph (5)—

(A) in the matter preceding subparagraph (A)—

(i) by inserting "partnerships, research collaborations, and" after "international"; and

(ii) by striking "science and technology security" and inserting "science, engineering, and technology";

(B) in subparagraph (A)—

(i) by inserting ", social benefit," after "innovation"; and

(ii) by striking "and" after the semicolon;

(C) in subparagraph (B), by striking the period and inserting "; and"; and

(D) by adding at the end the following new subparagraph:

"(C) to facilitate cooperative investment in quantum capabilities between the United States and its allies and partners to strengthen and secure the domestic supply chain and related ecosystem; and"; and

(7) by adding at the end the following new paragraph:

"(6) improving the maturity, scale, and short- and long-term viability of the quantum technology industry, including small and medium-sized businesses and startups representing a diversity of quantum specialties, and commercialization of domestic quantum capacity across modalities.".

SEC. 4. NATIONAL QUANTUM INITIATIVE PROGRAM.

Subsection (b) of section 101 of the National Quantum Initiative Act (15 U.S.C. 8811) is amended—

(1) in paragraph (1)—

(A) by striking "development" and inserting "research development, and near- and medium-term, and long-term demonstration";

(B) by striking "information science and technology"; and

(C) by inserting "in diverse sectors" after "applications";

(2) in paragraph (2)—

(A) by striking "fundamental";

(B) by striking "science and technology" and inserting "science, engineering, and technology"; and

(C) by inserting "infrastructure," after "demonstration,";

(3) in paragraph (3)—

(A) by inserting "and retain" after "to develop"; and

(B) by striking "science and technology" and inserting "science, engineering, and technology";

(4) by amending paragraph (4) to read as follows:

"(4) provide for interagency planning and coordination of Federal quantum information science, engineering, and technology research, development, demonstration, standards engagement, and other activities under the Program, including activities authorized pursuant to section 234 of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (10 U.S.C. 4001 note), quantum educational activities and programs authorized pursuant to section 10661 of the Research and Development, Competition, and Innovation Act (42 U.S.C. 19261), and activities conducted at any Federal laboratory;"; and

(5) in paragraph (5)—

(A) by striking "industry and universities" and inserting "industry, universities, and strategic allies"; and

(B) by inserting ", including human resources" after "resources".

SEC. 5. NATIONAL QUANTUM COORDINATION OFFICE.

Section 102 of the National Quantum Initiative Act (15 U.S.C. 8812) is amended—

(1) in subsection (a)(2)—

(A) in subparagraph (A)—

(i) by inserting "who shall be" before "appointed"; and

(ii) by inserting ", and who shall serve a four year term, subject to renewal" before the semicolon; and

(B) by amending subparagraph (B) to read as follows:

"(B) staff comprised of employees detailed from the Federal departments and agencies specified in section 103(b)."; and

(2) in subsection (b)—

(A) in paragraph (3), by striking "science and technology" and inserting "science, engineering, and technology research and workforce";

(B) in paragraph (6), by striking "and" after the semicolon;

(C) in paragraph (7), by striking the period at the end and inserting ";";

(D) by amending paragraph (4) to read as follows:

"(4) ensure coordination among the collaborative ventures or consortia established under this Act;";

(E) in paragraph (7), by inserting "non-profit research organizations," after "universities,"; and

(F) by adding after paragraph (7), the following new paragraphs:

"(8) promote understanding and adoption of quantum capabilities throughout the United States economy as appropriate; and

"(9) track and promote policies that will ensure stability of the United States quantum workforce, quantum supply chain, domestic quantum industry, and international trade.".

SEC. 6. SUBCOMMITTEE ON QUANTUM INFORMATION SCIENCE.

Section 103 of the National Quantum Initiative Act (15 U.S.C. 8813) is amended—

(1) in subsection (b)—

(A) in paragraph (8), by striking "and" after the semicolon;

(B) by redesignating paragraph (9) as paragraph (14); and

(C) by inserting after paragraph (8) the following new paragraphs:

"(9) the Department of Health and Human Services;

"(10) the Department of State;

"(11) the Department of Homeland Security;

"(12) the National Oceanic and Atmospheric Administration;

"(13) the Department of Education; and";

(2) in subsection (d)—

(A) in paragraph (1), by striking "the quantum information science and technology research" and inserting "quantum information science, engineering, and technology research and quantum application development, demonstration, and commercialization";

(B) in paragraph (4), by inserting ", engineering, and technology" after "science";

(C) in paragraph (5),

(i) by inserting ", engineering, and technology" after "science"; and

(ii) by inserting "and conduct comparative benchmarking of Federal investments and research strategies relative to

those of our strategic partners and other countries" after "development efforts";

(D) in paragraph (6)—

(i) by striking "science and technology" and inserting "science, engineering, and technology"; and

(ii) by striking "and" after the semicolon;

(E) in paragraph (7)—

(i) by inserting ", engineering and technology" after "science"; and

(ii) by striking the period and inserting "; and"; and

(F) by adding at the end the following new paragraph:

"(8) facilitate interagency partnership opportunities to advance quantum applications related to environment, advanced manufacturing, biotechnology, space, and other sectors.";

(3) in subsection (h)(2)(A), by inserting ", including a description of agency roles and responsibilities" before the period; and

(4) by adding at the end the following new subsection:

"(i) QUANTUM USE CASES.—

"(1) IN GENERAL.—The Subcommittee shall identify potential use cases with respect to which quantum computing could advance the missions of participating agencies, including through on-premises, cloud-based, hybrid, or networked approaches.

"(2) QUANTUM ON-RAMP.—For each potential use case identified pursuant to paragraph (1), the relevant Federal agency, in consultation with the Subcommittee, may develop a plan to enable such agency to address each such potential use case.

"(3) REPORTING.—The Subcommittee, as part of the annual report on the budget for the Program under subsection (g) shall report progress in carrying out the activities under this section, including information relating to the following:

"(A) The potential use cases identified pursuant to paragraph (1).

"(B) The status of plans developed pursuant to paragraph (2).

"(C) Any obstacles to addressing such potential use cases, including lack of funding.".

SEC. 7. NATIONAL QUANTUM INITIATIVE ADVISORY COMMITTEE.

Section 104 of the National Quantum Initiative Act (15 U.S.C. 8814) is amended—

(1) by amending subsection (b) to read as follows:

"(b) QUALIFICATIONS.—The Advisory Committee shall consist of members, appointed by the President, who are—

"(1) representative of industry, including end users likely to benefit from quantum technology and small and medium-sized businesses and startups representing a diversity of quantum specialties. universities, and Federal laboratories; and

"(2) qualified to provide advice and information on quantum information science, engineering, and technology research, development, demonstrations, standards, STEM education, technology transfer, commercial application, or national security and economic concerns.";

(2) in subsection (d)(2)—

(A) in subparagraph (A), by striking "science and technology" and inserting "science, engineering, and technology";

(B) by redesignating subparagraphs (D), (E), (F), and (G) as subparagraphs (E), (F), (G), and (H), respectively;

(C) by inserting after subparagraph (C) the following new subparagraph:

"(D) other countries' quantum programs and the progress of such countries and such programs relative to the Program;";

(D) in subparagraph (E), as so redesignated—

(i) by striking "to" and inserting "promote innovation, foster a robust United States quantum industry, and"; and

(ii) by striking "science and technology" and inserting "science, engineering, and technology"; and

(E) in subparagraph (F), as so redesignated, by inserting ", including to address any gaps that may exist" before the semicolon;

(F) in subparagraph (G), as so redesignated, by striking "open standards for, quantum information science and technology; and" and inserting "international standards in open and transparent standardization systems for quantum information science, engineering, and technology;";

(G) in subparagraph (H), as so redesignated—

(i) by inserting "educational, environmental, health," after "legal,"; and

(ii) by striking the period and inserting ";"; and

(H) by adding at the end the following new subparagraphs:

"(I) the domestic and international cooperation needs and goals of the Program, including needs and goals related to infrastructure and the supply chain of quantum information science, engineering, and technology; and

"(J) the degree to which quantum information science, engineering, and technology is enhancing or can enhance the capabilities of the United States advanced industrial economy and protect or optimize critical infrastructure (as such term is defined in section 1016(e) of Public Law 107–56 (42 U.S.C. 5195c(e))).";

(3) in subsection (e)—

(A) by inserting "through December 31, 2030" after "thereafter"; and

(B) by adding at the end the following new sentence: "In the first such report required after the date of the enactment of this sentence, the Advisory Committee shall assess the advisability and feasibility of establishing a quantum communications corridor in which Federal labora-

tories, institutions of higher education, and other entities conducting quantum information science, engineering, and technology research are connected via quantum communication networks capable of rapidly and securely transmitting large quantities of information.''; and

(4) by amending subsection (g) to read as follows:

''(g) FACA EXEMPTION.—The President shall charter the Advisory Committee in accordance with chapter 10 of title 5, United States Code (commonly referred to as the 'Federal Advisory Committee Act'), except that the Advisory Committee shall be exempt from section 1013 of such title.''.

SEC. 8. SUBCOMMITTEE ON THE ECONOMIC AND SECURITY IMPLICATIONS OF QUANTUM INFORMATION SCIENCE.

Section 105 of the National Quantum Initiative Act (15 U.S.C. 8814a) is amended—

(1) in subsection (b)—

(A) in paragraph (10), by striking ''and'' after the semicolon;

(B) by redesignating paragraph (11) as paragraph (14); and

(C) by inserting after paragraph (10) the following new paragraphs:

"(11) the Department of Health and Human Services;

"(12) the Department of State;

"(13) the National Aeronautics and Space Administration; and";

(2) in subsection (c)—

(A) in paragraph (1), by striking "information science" and inserting "information science, engineering, and technology";

(B) in paragraph (2), by inserting "or to supply chains" before the semicolon;

(C) in paragraph (3), by inserting "or supply chains" before the semicolon;

(D) in paragraph (5)—

(i) by inserting "and engineering" after "quantum information science"; and

(ii) by inserting "any" before "export controls";

(E) in paragraph (6), by striking "information science" and inserting "information science, engineering, and technology";

(F) in paragraph (7), by striking "and" after the semicolon;

(G) in paragraph (8)—

(i) by inserting "nonprofit research organizations," after "universities,"; and

(ii) by striking the period and inserting a semicolon; and

(H) by adding at the end the following new paragraphs:

"(9) in coordination with the Subcommittee on Quantum Information Science, identify opportunities to increase coordination between civilian, military, and intelligence quantum research entities, reduce unnecessary duplicative quantum research activities, and facilitate collaboration between quantum research agencies with specialized capabilities or expertise in one or more aspects of quantum information science, engineering, and technology; and

"(10) recommend strategies for attracting and retaining students and scholars with expertise in quantum related fields to Federal departments and agencies.".

SEC. 9. INTERNATIONAL QUANTUM COOPERATION STRATEGY.

The National Quantum Initiative Act is amended by inserting after section 105 the following new section:

"SEC. 105A. INTERNATIONAL QUANTUM COOPERATION STRATEGY.

"(a) STRATEGY REQUIRED.—Not later than one year after the date of the enactment of this section, the Director of the Office of Science and Technology Policy, in consultation with the Secretary of Commerce, the Secretary of State, the Secretary of Energy, the Director of the National Science Foundation, and the heads of other Federal agencies, as appropriate, shall develop and submit to the Committee on Commerce, Science, and Transportation, the Committee on Energy and Natural Resources, and the Committee on Foreign Relations of the Senate, and the Committee on Science, Space, and Technology and the Committee on Foreign Affairs of the House of Representatives a strategy to—

"(1) establish collaborative international partnerships, including co-funded international programs, to advance research and development, testing and evaluation, commercialization, and interoperability in quantum information science, engineering, and technology with allies and partners of the United States, and other countries, when in the security, strategic, technological, and scientific interests of the United States;

"(2) ensure continued United States participation in bilateral and multilateral efforts to advance

quantum information science, engineering, and technology on the international stage;

"(3) promote the integrity and impartiality of international standards organizations and processes related to quantum information science, engineering, and technology; and

"(4) ensure ethical application of quantum information science, engineering, and technology to protect civil liberties and basic human rights.

"(b) DESIGNATION.—The strategy under subsection shall be known as the 'International Quantum Cooperation Strategy' (in this section referred to as the 'Strategy').

"(c) ELEMENTS.—In the development of the Strategy, the Director of the Office of Science and Technology Policy, the National Quantum Coordination Office, the Subcommittee on Quantum Information Science, the Subcommittee on the Economic and Security Implications, and the relevant agencies should consider the following:

"(1) The establishment of international partnerships to advance research and development in quantum information science, engineering, and technology.

"(2) Key partners that are allies of the United States and have demonstrated unique capabilities in one or more areas of quantum information science, engineering, and technology.

"(3) Efforts and plans to address risks to the national security and economic interests of the United States during development and deployment of quantum technologies worldwide, including plans for diplomatic engagement with allies and partners, and other countries.

"(4) Efforts and plans to promote responsible global development and deployment of quantum technologies, including through international engagement and leadership in the development of international standards.

"(5) Efforts and plans to develop, attract, and retain international talent.

"(6) The ability and risks of domestic manufacturers and suppliers and those of allies and partners of the United States to meet the needs of the global quantum supply chain, including raw materials such as Helium–3, plans for engagement with allies and partners, manufacturers, and suppliers, and options to mitigate gaps and vulnerabilities in the global quantum supply chain.

"(7) A plan to safeguard research and technology supported through international cooperation, as appropriate, in whole or in part, including in quantum technologies critical to national security, from malign

influence, theft, or exfiltration by foreign entities of concern.

"(8) As necessary, a description of such legislative or administrative action needed to carry out the Strategy.

"(d) BRIEFING.—Not later than 30 days after the date on which the Strategy is completed, the Director shall brief the committees specified in subsection (a) on the Strategy.".

SEC. 10. SUNSET.

Section 106(a) of the National Quantum Initiative Act (15 U.S.C. 8815(a)) is amended to read as follows:

"(a) IN GENERAL.—Except as provided in subsection (b), the authority to carry out sections 101, 102, 103, 104, and 105 shall terminate on December 30, 2030.".

SEC. 11. NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY ACTIVITIES AND QUANTUM CONSORTIUM.

Section 201 of the National Quantum Initiative Act (15 U.S.C. 8831) is amended—

(1) in subsection (a)—

(A) in paragraph (1)—

(i) by striking "basic and applied"; and

(ii) by striking "science and technology" and inserting "science, engineering, and technology";

(B) in paragraph (2)—

(i) by inserting "attract, educate, and" before "train"; and

(ii) by striking "science and technology" and inserting "science, engineering, and technology";

(C) by amending paragraph (3) to read as follows:

"(3) shall carry out research to facilitate the development and standardization of quantum cryptography, post-quantum cryptography (as such term is defined in section 3 of the Quantum Computing Cybersecurity Preparedness Act (6 U.S.C. 1526 note; Public Law 117–260)), and practices to replace cryptographic keys or algorithms with minimal disruption to current applications and systems;".

(D) by amending paragraph (4) to read as follows:

"(4) shall carry out research, development, and demonstration projects, as appropriate, to facilitate the development and standardization of quantum networking, communications, computing, metrology,

sensing technologies and quantum applications, including quantum supporting technologies, such as artificial intelligence;".

(E) by redesignating paragraphs (5), (6), and (7) as paragraphs (8), (9), and (11), respectively;

(F) by inserting the following after paragraph (4) the following new paragraphs:

"(5) shall carry out research to support the measurement of comparative performance and progress of quantum technologies, including, as practicable, technology readiness assessments of quantum technologies;

"(6) shall promote United States participation in international standards organizations related to quantum information science, engineering, and technology;

"(7) shall establish or expand partnerships with the public sector and private sector to—

"(A) accelerate the development of domestic quantum supply chain and supply chain-supporting technologies; and

"(B) reduce quantum supply chain vulnerabilities;";

(G) in paragraph (8), as so redesignated, by striking "infrastructure" and inserting ", communications, sensing, and computing";

(H) in paragraph (9), as so redesignated—

(i) by inserting "non-profit research organizations," after "universities,"; and

(ii) by striking "and engineering; and" and inserting ", engineering, and technology and expanding the domestic STEM workforce;"; and

(I) by inserting after paragraph (9) the following the following new paragraph:

"(10) shall establish such infrastructure as is necessary to carry out title II; and";

(2) in subsection (b)—

(A) in paragraph (1)—

(i) by striking "future" and inserting "research"; and

(ii) by striking "science and technology" and inserting "science, engineering, and technology";

(B) in paragraph (2)—

(i) by amending subparagraph (A) to read as follows:

"(A) to gather and assess information on the quantum industry to address the needs identified in paragraph (1);";

(ii) by striking subparagraphs (B) and (C) and inserting the following new subparagraphs:

"(B) to provide recommendations regarding how the National Institute of Standards and Technology, the Program, and other Federal agencies, as appropriate, can address the gaps in the research necessary to meet the needs identified in paragraph (1) and accelerate real-world uses of quantum information science, engineering, and technology;

"(C) to identify enabling technologies and the relevant supply chain essential to foster research and industrial competitiveness in quantum information science, engineering, and technology, and communicate findings to Federal agencies and other domestic and international stakeholders;

"(D) to assess and identify key areas for establishing, expanding, or developing international partnerships that will facilitate United

States quantum-related business engagement; and

"(E) to provide recommendations on how the National Institute of Standards and Technology, the Program, and other Federal agencies, as appropriate, can incorporate small and medium-sized businesses and startups into Federal quantum activities and promote the success of small and medium-sized startups.";

(C) in paragraph (3)—

(i) by striking "Not later than 2 years after the date of enactment of this Act, the" and inserting "The"; and

(ii) by inserting "periodically, but not less than every five years," after "shall"; and

(D) by adding at the end the following new paragraph:

"(4) COORDINATION.—As appropriate, the consortium is encouraged to engage with Federal agencies that fund research, have a mission to transition or translate research results to practical quantum applications, or have a mission that could benefit from the development of quantum technologies, to inform and accelerate progress in such areas."; and

(3) by striking subsection (c) and inserting the following new subsections:

"(c) INTERNATIONAL QUANTUM RESEARCH AND METROLOGY.—

"(1) IN GENERAL.—The Director of the National Institute of Standards and Technology, in coordination with the Secretary of State and the Director of the National Science Foundation, shall promote, establish, and support international quantum information science, engineering, and technology research, metrology research, and standardization, as appropriate, to enhance international cooperation, meet United States commitments, and support United States engagement in international standards for quantum information science, engineering, and technology.

"(2) ALIGNMENT.—In carrying out this section, the Director of the National Institute of Standards and Technology shall ensure alignment with the National Quantum Information Science Strategy and the U.S. Government National Standards Strategy for Critical and Emerging Technology, or successor strategies.

"(3) RESTRICTIONS.—

"(A) CONFUCIUS INSTITUTE.—None of the funds made available under this section may be obligated or expended to an institution of higher education that maintains a contract or agreement between such institution and a Confucius Institute or any successor of a Confucius Institute.

"(B) FOREIGN COUNTRIES OR ENTITIES OF CONCERN.—None of the funds made available under this section may be obligated or expended to promote, establish, or finance quantum research activities between a United States entity and a foreign country of concern or foreign entity of concern, except such restriction shall not apply to participation by awardees in consensus-based international standardization activities.

"(d) POST QUANTUM CRYPTOGRAPHY DEPLOYMENT.—

"(1) IN GENERAL.—The Director of the National Institute of Standards and Technology, in consultation with the Secretary of Homeland Security, the heads of Sector Risk Management Agencies (as such term is defined in section 2200 of the Homeland Security Act of 2002 (6 U.S.C. 650)), and private sector entities, as appropriate, shall promote the voluntary development, adoption, and deployment of standards

relating to post-quantum cryptography (as such term is defined in section 3 of the Quantum Computing Cybersecurity Preparedness Act (6 U.S.C. 1526 note; Public Law 117–260)), including by—

"(A) disseminating and making publicly available guidance and resources to help organizations adopt and deploy standards relating to post-quantum cryptography and minimize disruptions to current applications and systems caused by cryptographic updates;

"(B) providing technical assistance, as practicable, to entities that are at high risk of quantum cryptoanalytic attacks, such as entities determined to be critical infrastructure (as such term is defined in section 1016(e) of Public Law 107–56 (42 U.S.C. 5195c(e))) or digital infrastructure providers; and

"(C) conducting such other activities as determined necessary by the Director to promote the development, adoption, and deployment across the United States of standards relating to post-quantum cryptography.

"(2) GRANT PROGRAM.—

"(A) IN GENERAL.—Subject to the availability of appropriations and after the date on

which the Director of National Institute of Standards and Technology has issued standards relating to post-quantum cryptography, the Director may establish a program to identify and provide technical assistance through the award of grants to entities that are at high risk of quantum cryptoanalytic attacks, including by granting funds for the adoption of such standards and the remediation of quantum-related vulnerabilities.

"(B) USE OF FUNDS.—Grants awarded to entities under this paragraph may be used to cover reasonable costs, up to a specified amount established by the Director of the National Institute of Standards and Technology, for activities to adopt standards relating to post-quantum cryptographic and remediate quantum-related vulnerabilities.

"(C) GUIDANCE.—The Director of the National Institute of Standards and Technology may develop, and periodically update, guidance, including relating to eligibility, application disclosure requirements, grant amount and duration, and any additional requirements regarding the award of grants under this paragraph.

"(D) CONSULTATION.—If the program described in this paragraph is established, the Director of the National Institute of Standards and Technology shall consult with the Director of the Cybersecurity and Infrastructure Security Agency of the Department of Homeland Security, the heads of other Sector Risk Management Agencies, and appropriate representatives of private sector entities, including nonprofit organizations, to share information regarding the grant program under this paragraph and guidance developed and updated under subparagraph (C).

"(e) FUNDING.—Of the funds authorized to be appropriated for the National Institute of Standards and Technology pursuant to section 10211 of the Research and Development, Competition, and Innovation Act (Public Law 117–167) for scientific and technical research and services laboratory activities, there is authorized to be appropriated to the Director of the National Institute of Standards and Technology to carry out this section up to $85,000,000 for each of fiscal years 2024 through 2027.".

SEC. 12. NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY QUANTUM CENTERS.

Title II of the National Quantum Initiative Act is amended by adding at the end the following new sections:

"SEC. 202. NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY QUANTUM CENTERS.

"(a) ESTABLISHMENT.—

"(1) IN GENERAL.—Subject to the availability of appropriations, the Director of the National Institute of Standards and Technology, in consultation with the heads of other Federal departments and agencies, as appropriate, shall carry out a program to establish and operate at least one, but not more than three, centers to accelerate research, development, deployment, and standardization of quantum information science, engineering, and technology.

"(2) PROGRAM DETAILS.—

"(A) COMPETITIVE, MERIT-REVIEWED PROCESS.—The centers shall be established through a competitive, merit-reviewed process.

"(B) APPLICATIONS.—An eligible applicant described in subparagraph (C) shall submit to the Director of the National Institute of Standards and Technology an application at such time, in such manner, and containing such information as the Director determines to be appropriate.

"(C) ELIGIBLE APPLICANTS.—Eligible applicants described in this subparagraph are the following:

"(i) Institutions of higher education.

"(ii) Nonprofit organizations.

"(iii) Multi-institutions collaborations, including multiple types of research institutions, private sector entities, Federal laboratories, and nonprofit organizations, or a consortia thereof.

"(iv) Any other entity the Director determines appropriate.

"(3) SELECTION OF TOPICS.—The Director of the National Institute of Standards and Technology shall solicit proposals and prioritize the following topics in the initial selection of centers, subject to merit-review:

"(A) Quantum sensing and measurement.

"(B) Quantum engineering.

"(b) REQUIREMENTS.—To the maximum extent practicable, centers developed, constructed, operated, or maintained under this section shall serve the mission of the National Institute of Standards and Technology, for the benefit of the broader United States quantum information science community, to develop processes for the following purposes—

"(1) Advancing research and standardization in quantum information science, engineering, and technology.

"(2) Advancing technology transfer.

"(3) Improving the competitiveness of the United States.

"(c) COORDINATION.—The Director of the National Institute of Standards and Technology shall ensure coordination, and avoid unnecessary duplication of, the activities carried out under this section with existing activities of the Institute, other activities carried out under this Act, and other related programs, as appropriate.

"(d) SELECTION AND DURATION.—

"(1) IN GENERAL.—The centers established under this section are authorized to carry out activities for a period of five years.

"(2) RENEWAL.—Each center established under this section may be renewed for an additional period of five years following a successful merit-based review by the Director.

"(3) TERMINATION.—Consistent with the authorities of the National Institute of Standards and Technology, the Director of the National Institute of Standards and Technology may terminate an underperforming center for cause during the performance period.

"(e) FUNDING.—The Director of the National Institute of Standards and Technology shall allocate up to

$18,000,000 for each center established under this section for each of fiscal years 2024 through 2028, subject to the availability of appropriations. Amounts made available to carry out this section shall be derived from amounts appropriated or otherwise made available to the National Institute of Standards and Technology.

"SEC. 203. RESEARCH SECURITY.

"The activities authorized under title II shall be applied in a manner consistent with subtitle D of title VI of the Research and Development, Competition, and Innovation Act (enacted as division B of Public Law 117–167; 42 U.S.C. 19231 et seq.).".

SEC. 13. NATIONAL SCIENCE FOUNDATION QUANTUM INFORMATION SCIENCE RESEARCH AND EDUCATION ACTIVITIES.

Section 301 of the National Quantum Initiative Act (15 U.S.C. 8841) is amended—

*(1) in the heading, by inserting "**, ENGINEERING, AND TECHNOLOGY**" after "**SCIENCE**";*

(2) in subsection (a)—

(A) by striking "basic"; and

(B) by striking "science and engineering" and inserting "science, engineering, and technology";

(3) in subsection (b)—

(A) in paragraph (1)—

(i) in subparagraph (A)—

(I) by striking "basic"; and

(II) by striking "science and engineering" and inserting "science, engineering, and technology"; and

(ii) in subparagraph (B)—

(I) by striking "human resources" and inserting "education and workforce"; and

(II) by striking "science and engineering" and inserting "science, engineering, and technology"; and

(B) in paragraph (2)—

(i) in subparagraph (A)—

(I) in clause (i)—

(aa) by striking "science and engineering" and inserting "science, engineering, and technology";

(bb) by inserting "K–12, vocational," before "undergraduate"; and

(cc) by striking "and" after the semicolon;

(II) in clause (ii), by inserting "and" after the semicolon; and

(III) by adding at the end the following new clause:

"(iii) to pursue research at the frontiers of quantum information science, engineering, and technology, and explore solutions to important challenges for the development, application, and commercialization of quantum technologies;";

(ii) in subparagraph (B), by striking "science and engineering" and inserting "science, engineering, and technology"; and

(iii) in subparagraph (C), by striking "science and engineering" and inserting "science, engineering, and technology";

(iv) in subparagraph (D), by striking "and" after the semicolon;

(v) in subparagraph (E), by striking the period and inserting "; and"; and

(vi) by adding at the end the following new subparagraph:

"(F) providing infrastructure to support academic quantum information science, engineering, and technology, including through exist-

ing infrastructure programs and new activities.";

(4) by amending subsection (c) to read as follows:

"(c) STUDENT TRAINEESHIPS, FELLOWSHIPS, AND OTHER MODELS.—

"(1) IN GENERAL.—The Director of the National Science Foundation, in consultation with heads of Federal agencies the Director considers appropriate, shall award grants to institutions of higher education or eligible nonprofit organizations (or consortia thereof) to increase capacity and broaden participation, including through provisioning of experiential opportunities, where appropriate, in quantum information science, engineering, and technology and other related disciplines.

"(2) QUANTUM TRAINEESHIPS.—The Director of the National Science Foundation may establish or use existing programs to make awards to institutions of higher education or nonprofit organizations (or consortia thereof) to provide traineeships to graduate students at institutions of higher education within the United States who are citizens of the United States and who choose or plan to pursue masters or doctoral degrees in quantum information science, engineering,

and technology, or related fields, and by providing students with opportunities for research experiences in government or industry related to such students' quantum studies.

"(3) QUANTUM FELLOWSHIPS AND SCHOLARSHIPS.—

"(A) IN GENERAL.—The Director of the National Science Foundation may establish or use existing programs to support fellowships and scholarships for students at institutions of higher education for the purpose of increasing quantum information science, engineering, and technology exposure for undergraduate and graduate STEM students and increasing post-graduation employment opportunities for STEM students.

"(B) REQUIREMENTS.—Eligible participants in the fellowship and scholarship program shall—

"(i) be enrolled in or have graduated from a STEM degree program at a domestic institution of higher education; and

"(ii) have taken at least one quantum-science or quantum-relevant course as part of their degree programs.

"(C) CONSIDERATIONS.—Eligible fellowships and scholarships may include temporary quantum-related positions at State or Federal agencies, national laboratories, private sector entities, institutions of higher education, the Quantum Centers and Institute established in sections 202, 302, 402, and 502, or other quantum-relevant entities, as determined appropriate by the Director.

"(D) COMPETITIVE AWARDS.—Fellowships and scholarships shall be competitively awarded through a merit-review process. The Director of the National Science Foundation may prioritize fellowships that include an industry partner that provides financial assistance to the applicant for direct or indirect costs.

"(4) QUANTUM RESEARCH EXPERIENCES FOR UNDERGRADUATES.—The Director of the National Science Foundation shall seek to increase opportunities for quantum research for undergraduate students by encouraging proposals in quantum information science, engineering, and technology, through the research experiences for undergraduates pursuant to section 514 of the America COMPETES Reauthorization Act of 2010 (42 U.S.C. 1862p–6).

"(5) CO-OPERATIVE EDUCATION PROGRAMS.—The Director of the National Science Foundation may establish or use existing programs to support cooperative education programs between institutions of higher education and employers that increase opportunities for undergraduate students to acquire experiential learning and professional experiences in quantum information sciences, engineering, and technology.

"(6) PARTNERSHIPS.—In carrying out the activities under this subsection, the Director of the National Science Foundation shall encourage awardees to partner with relevant Federal agencies, Federal laboratories, industry and other private sector organizations, and nonprofit organizations to facilitate the expansion of workforce pathways and hands-on learning experiences.";

(5) in subsection (d)—

(A) in the subsection heading, by striking "QISE" and inserting "QISET";

(B) in paragraph (1)—

(i) by striking "information science and engineering (referred to in this subsection as 'QISE')" and inserting "information science, engineering, and technology

(referred to in this subsection as QISET)";
and

(ii) by inserting "and career and technical education entities" after "colleges";

(C) in paragraph (2)—

(i) in subparagraph (A), by striking "QISE" and inserting "quantum information science, engineering, and technology";

(ii) in subparagraph (D), by inserting ", engineering, and technology" after "science";

(iii) in subparagraph (D), by inserting ", including those relevant to emerging technologies, such as artificial intelligence, microelectronics, and nano technology" after "fields".

(iv) by redesignating subparagraphs (E) and (F) as subparagraphs (F) and (H), respectively;

(v) by inserting after subparagraph (D) the following new subparagraph:

"(E) Informal education methods to enhance experiences of students of all ages with quantum information science, engineering, and technology concepts and applications.";

(vi) by inserting after subparagraph (F), as so redesignated, the following new subparagraph:

"(G) Methods to introduce security and other potential societal dimensions associated with quantum information science, engineering, and technology into STEM curricula."; and

(vii) in subparagraph (H), as so redesignated, by inserting ", engineering, and technology" after "science";

(D) in paragraph (3), by striking "QISE" and inserting "quantum information science, engineering, and technology"; and

(E) by striking paragraph (4); and

(6) by adding at the end the following new subsections:

"(e) QUANTUM RESEARCH EXPERIENCES FOR TEACHERS.—The Director of the National Science Foundation shall seek to increase opportunities to engage educators, principals, or other school leaders of K-12 students in professional learning opportunities to enhance quantum information science, engineering, and technology knowledge, including by—

"(1) providing hands-on training and research opportunities for such educators at Federal Labora-

tories, institutions of higher education, or in industry; and

"(2) developing best practices.

"(f) EXPANDING CAPACITY IN QUANTUM INFORMATION SCIENCE, ENGINEERING, AND TECHNOLOGY (QISET).—

"(1) IN GENERAL.—The Director of the National Science Foundation, in consultation with the heads of Federal agencies the Director considers appropriate, shall make awards on a competitive, merit-reviewed basis to eligible institutions of higher education or eligible nonprofit organizations (or consortia thereof) to increase research capacity, education and infrastructure capacity, and broaden participation in quantum information science, engineering, and technology and related disciplines, including by—

"(A) supporting curriculum development in quantum information science, engineering, and technology as described in section 301(d) of the National Quantum Initiative Act (15 U.S.C. 8841(d));

"(B) building upon the activities carried out under the Next Generation Quantum Leaders Pilot Program authorized under section 10661(f) of the Research and Development, Competition,

and Innovation Act (Public Law 117–167; 42 U.S.C. 19261(f)); and

"(C) leveraging the readiness for the involvement of local research and education communities to secure a talent pipeline in quantum information science, engineering, and technology to meet the workforce needs of industry, government, and academia.

"(2) COLLABORATIONS.—A collaboration receiving an award under this subsection may include institutions of higher education, nonprofit organizations, and private sector entities.

"(3) ELIGIBLE INSTITUTION OF HIGHER EDUCATION DEFINED.—In this subsection, the term 'eligible institution of higher education' means an institution of higher education, that, according to the data published by the National Center for Science and Engineering Statistics, is not, on average, among the top 100 institutions in Federal research and development expenditures during the 3- year period prior to the year of the award.

"(4) REQUIREMENTS.—To receive an award under this subsection, an eligible institution shall submit to the Director of the National Science Foundation an application that includes the following:

"(A) A plan to sustain proposed activities beyond the duration of the award.

"(B) Proposed quantum information science, engineering, and technology disciplines and focus areas the eligible institution is prepared to engage in to significantly build up its quantum information science, engineering, and technology research and education capacity.

"(C) A plan for education and workforce development, which may include K-12 and postsecondary education programs and activities, workforce training and career and technical education programs and activities, undergraduate, graduate, and postdoctoral education, and informal education programs and activities.

"(5) ACTIVITIES.—Awards under this subsection to support research and related activities may include the activities relating to the following:

"(A) Development or expansion of research programs in disciplines and focus areas specified in paragraph (4)(B).

"(B) Faculty recruitment and professional development in disciplines and focus areas specified in paragraph (4)(B).

"(C) Bridge programs focused on preparing post-baccalaureate students for graduate programs in quantum information science, engineering, and technology.

"(D) To build research capacity and infrastructure at an eligible institution in disciplines and focus areas specified in paragraph (4)(B).

"(E) An assessment of capacity-building and research infrastructure needs identified in paragraph (4)(B).

"(F) Administrative research development support.

"(G) Other activities necessary to build research capacity in quantum information science, engineering, and technology.

"(6) ADDITIONAL CONSIDERATIONS.—In making awards under this subsection, the Director of the National Science Foundation may also consider the following:

"(A) The extent to which the eligible applicant will support students from diverse backgrounds, including first-generation undergraduate students.

"(B) The geographic and institutional diversity of eligible applicants.

"(C) How the eligible applicant can leverage public-private partnerships and existing research partnerships with Federal agencies.

"(7) DUPLICATION.—The Director of the National Science Foundation shall ensure awards made under this subsection are complimentary to and not duplicative of existing programs.

"(g) FACULTY MID-CAREER DEVELOPMENT AWARDS.—The Director of the National Science Foundation may provide awards to support mid-career scientists and faculty to upgrade, develop, or acquire essential research instruments to start new research activities, or expand existing activities, focused on quantum information science, engineering and technology.

"(h) INTERNATIONAL RESEARCH ON QUANTUM INFORMATION SCIENCE, ENGINEERING, AND TECHNOLOGY.—

"(1) IN GENERAL.—The Director of the National Science Foundation, in coordination with the Secretary of State and the Secretary of Commerce, shall support international quantum information science, engineering, and technology research, as appropriate, to enhance international cooperation and meet United States commitments, including as part of the terms and conditions of bilateral or multilateral quantum

information science, engineering, and technology research agreements.

"(2) ALIGNMENT.—In carrying out this subsection, the Director of the National Science Foundation shall ensure alignment with the national Quantum Information Strategy in accordance with Executive Order 14073 or successor strategies.

"(3) PRIORITY.—The Director shall prioritize research programs with countries that have signed a Quantum Cooperation Statement with the United States.

"(4) RESTRICTIONS.—

"(A) CONFUCIUS INSTITUTE.—None of the funds made available under this section may be obligated or expended to an institution of higher education that maintains a contract or agreement between such institution and a Confucius Institute or any successor of a Confucius Institute.

"(B) FOREIGN COUNTRY OF CONCERN AND FOREIGN ENTITY OF CONCERN.—None of the funds made available under this section may be obligated or expended to promote, establish, or finance quantum research activities between a

United States entity and a foreign country of concern or foreign entity of concern.

"(i) UPGRADING AND IMPROVING ACCESS TO QUANTUM RESEARCH RESOURCES.—

"(1) IN GENERAL.—In carrying out the activities described in this section, the Director of the National Science Foundation, in consultation with the heads of other Federal departments and agencies, as appropriate, shall award grants to institutions of higher education or eligible nonprofit organizations (or consortia thereof) to upgrade research facilities and improve access to research resources, such as equipment and instrumentation, that is needed for research and development in quantum information science, engineering, and technology.

"(2) PURPOSE.—Grants under paragraph (1) shall be used to facilitate quantum information science, engineering, and technology research and development, including by carrying out the following:

"(A) Upgrading or adding research resources to accelerate the development of quantum technologies, including capabilities focused on addressing the roadblocks to implementation, and meet the materials, advanced materials development, high performance computing, hetero-

geneous computing, networking, software, data, clean room, and device needs of the scientific community and the quantum supply chain.

"(B) Enhancing access to equipment and instrumentation, including at partnering institutions, by facilitating information sharing, coordination, scheduling, education, and training, including activities that provide meaningful hands-on learning experiences for students, including at community and technical colleges.

"(C) Enabling professional staff to support the operation and improvement of research resources used for quantum information science, engineering, and technology.

"(3) REQUIREMENTS.—An institution of higher education or an eligible nonprofit organization (or a consortium thereof) and industry partners seeking funding under this subsection shall submit to the Director of the National Science Foundation an application at such time, in such manner, and containing such information as the Director may require.

"(j) FUNDING.—Of the funds authorized to be appropriated to the National Science Foundation pursuant to section 10303 of the Research and Development, Competition, and Innovation Act (Public Law 117–167) for re-

search and related activities, there is authorized to be appropriated to the Director of the National Science Foundation to carry out this section up to $141,000,000 for each of fiscal years 2024 through 2027.".

SEC. 14. MULTIDISCIPLINARY CENTERS FOR QUANTUM RESEARCH AND EDUCATION.

Section 302 of the National Quantum Initiative Act (15 U.S.C. 8842) is amended—

(1) in subsection (a), by striking "5" and inserting "10";

(2) in subsection (c)—

(A) in the matter preceding paragraph (1), by striking "basic";

(B) in paragraph (1), by striking "science and engineering" and inserting "science, engineering, and technology"; and

(C) in paragraph (2), by striking "and engineering" and inserting ", engineering, and technology, including leveraging or expanding activities established pursuant to section 301(d)";

(3) in subsection (d)(2)—

(A) in subparagraph (A), by striking "quantum science" and inserting "quantum information science, engineering, and technology";

(B) in subparagraph (B), by inserting "health," after "chemistry,";

(C) in subparagraph (C), by inserting ", including how each participant will develop and implement outreach activities to increase the participation of women and other students from groups historically underrepresented in STEM" before the semicolon;

(D) in subparagraph (D), by striking "and" after the semicolon;

(E) in subparagraph (E), by striking the period and inserting "; and"; and

(F) by adding at the end the following new subparagraph:

"(F) how the Center will participate in international collaborations, as appropriate, to build a trusted global research network with allies and partners of the United States and other countries that share values with the United States, including respect for international norms of fair competition.";

(4) in subsection (e), by amending paragraph (2) to read as follows:

"(2) REAPPLICATION.—An awardee may reapply for an additional, subsequent period of 5 years following a successful, merit-based review."; and

(5) in subsection (f), by striking "2019 through 2023" and inserting "2024 through 2028".

SEC. 15. QUANTUM RESKILLING, EDUCATION, AND WORKFORCE (QREW) COORDINATION HUB.

Title III of the National Quantum Initiative Act (15 U.S.C. 8841 et seq.) is amended by adding at the end the following new sections:

"SEC. 303. QUANTUM RESKILLING, EDUCATION, AND WORKFORCE (QREW) COORDINATION HUB.

"(a) IN GENERAL.—The Director of the National Science Foundation, in consultation with the Director of the National Institute of Standards and Technology, the Secretary of Energy, and the heads of other relevant Federal departments and agencies, as appropriate, shall make an award to a consortium led by an institution of higher education or an eligible nonprofit organization to establish a Quantum Reskilling, Education, and Workforce Coordination Hub (in this section referred to as the 'Hub').

"(b) CONSORTIUM.—The Hub established pursuant to subsection (a) shall include not fewer than four institutions of higher education, including not fewer than two commu-

nity colleges, and may include career and technical schools, nonprofit organizations, and private sector entities.

"(c) PURPOSE.—The purpose of this Hub shall be to—

"(1) identify and address cross-cutting workforce development challenges in quantum information science, engineering, and technology, and the quantum industry, by serving as a national and regional clearinghouse; and

"(2) facilitate the establishment of programs to disseminate to institutions of higher education and career and technical education entities model curricula, best practices, and instructional materials.

"(d) ACTIVITIES.—The activities of the Hub may include the following:

"(1) Testing, implementing, scaling, disseminating, and standardizing materials, methods, best practices, and other outputs developed through activities under this Act.

"(2) Increasing the integration of quantum information science, engineering, and technology content into STEM curricula at all education levels, including career and technical education programs.

"(3) Providing opportunities for STEM degree students to provide feedback on quantum information science, engineering, and technology curricula.

"(4) Facilitating post-education employment opportunities and workforce pathways for STEM degree recipients in quantum-related industries, including by facilitating opportunities for internships, externships, fellowships, and other such activities as determined by the Director, including through the establishment of a publicly accessible online portal.

"(5) Coordinating with quantum industry and nonprofit entities and small and medium-sized businesses and startups to inform and enhance the quality and availability of quantum education in STEM degree programs, including through the promotion of post-graduation opportunities for STEM students outside the classroom to increase exposure to quantum industries.

"(6) Supporting activities and programs to enhance the recruitment of students from groups historically underrepresented in STEM to pursue undergraduate and graduate studies in quantum information science, engineering, and technology.

"(7) Developing, testing, implementing, and coordinating career development programs and strategies for pre-university and university educators for the purpose of increasing the number of quantum-in-

formed educators at all levels of education, including by carrying out the following:

"(A) Hosting career development workshops.

"(B) Developing in-house and distance learning career development tools for public use.

"(C) Facilitating access to related quantum technology, tools, and resources.

"(D) Developing training, research, and professional development programs, including innovative pre-service and in-service programs.

"(E) Facilitating relationships with State and local entities to increase awareness of and promote quantum-related career development activities at the Hub.

"(8) Establishing a framework for performing ongoing regular data collection and analysis for the quantum workforce to report on trends, and perform other activities that expand the understanding of the current and future needs of the quantum industry, and education capacity or readiness of the quantum workforce. Such activities shall complement or align with, as relevant, authorized quantum and STEM workforce studies under section 10661(d) of the Research and Development, Competition, and Innovation Act (42 U.S.C. 19261(d)).

"(9) Facilitating public education and outreach activities to enhance the understanding and awareness of quantum information science, engineering, and technology to a boarder community to satisfy broader impact requirements of award applications.

"(10) Encouraging coordination on quantum education in the broader STEM community.

"(e) QREW QUANTUM FELLOWSHIP PROGRAM.—Subject to the restrictions outlined in subsection (c) of section 301, the Hub may support education or policy fellowships for students at entities participating in the consortium under subsection (a) or at other research centers established pursuant to this Act at the National Science Foundation, the National Institute of Standards and Technology, the Department of Energy, or the National Aeronautics and Space Administration, for the purpose of supporting the activities described in subsection (d).

"(f) INDUSTRY COORDINATION.—The Hub shall collaborate with the Quantum Consortium established in section 201(b) or other industry consortia to identify, publish, facilitate, or enable quantum-related education and workforce development opportunities as described in subsections (c) and (d).

"(g) APPLICATION.—A consortium seeking funding under this section shall submit to the Director of the Na-

tional Science Foundation an application at such time, in such manner, and containing such information as the Director may require. Each application shall include a description of how the consortium shall carry out the following:

"(1) Contribute to the success of the Hub and fulfill the purposes of the Hub.

"(2) Include industry participation in fulfilling the purposes of the Hub.

"(3) Collaborate with other members of the consortium to share expertise in integrating quantum information science, engineering, and technology into existing STEM programs and other relevant fields and disciplines.

"(4) Support long-term and short-term workforce development in the quantum field.

"(5) Develop and implement outreach activities to increase the participation of women and other students from groups historically underrepresented in STEM.

"(h) SELECTION AND DURATION.—

"(1) IN GENERAL.—The Hub established under this section is authorized to carry out activities for a period of 5 years.

"(2) REAPPLICATION.—An awardee may reapply for an additional, subsequent period of 5 years following a successful, merit-based review.

"(3) TERMINATION.—Consistent with the authorities of the National Science Foundation, the Director of the National Science Foundation may terminate the Hub if it is underperforming during the performance period.

"(i) COORDINATION.—The Hub shall coordinate with other research centers established under this Act at the National Science Foundation, the National Institute of Standards and Technology, the Department of Energy, the National Aeronautics and Space Administration, and other relevant Federal agencies, as appropriate, on activities and resources.

"(j) FUNDING.—The Director of the National Science Foundation shall allocate up to $10,000,000 for the Hub for each of fiscal years 2024 through 2028, subject to the availability of appropriations. Amounts made available to carry out this section shall be derived from amounts appropriated or otherwise made available to the National Science Foundation.

"SEC. 304. QUANTUM TESTBEDS.

"(a) IN GENERAL.—Not later than one year after the date of the enactment of this Act, the Director of the Na-

tional Science Foundation, in coordination with the Director of the National Institute of Standards and Technology, the Secretary of Energy, and the heads of other Federal agencies, as determined appropriate by the Director of the National Science Foundation, shall make awards on a competitive, merit-reviewed basis to institutions of higher education, nonprofit organizations, Federally Funded Research and Development Centers, or consortia thereof, to establish not more than five testbeds for quantum applications research and development.

"(b) PURPOSES.—The quantum testbeds established under subsection (a) shall focus on advancing research and development for near-term and medium-term quantum application use cases by providing accessible research resources to academia and industry for developing and testing such use cases, including through proof-of-concept testing, demonstrations, pilot projects, and prototyping.

"(c) APPLICATION PROPOSALS.—An applicant for an award under this section shall submit to the Director a proposal at such time, in such manner, and containing such information as the Director may reasonably require. The proposal shall, at a minimum, describe the following:

"(1) How the applicant will assemble a workforce, including from populations that are historically

underrepresented in STEM, with the skills needed to operate a quantum testbed.

"(2) How the applicant will ensure broad access to a quantum testbed, including for start-ups and small businesses.

"(3) How a quantum testbed will operate after Federal funding has ended.

"(d) PRIORITIZATION.—The Director of the National Science Foundation shall prioritize the following:

"(1) Applicants that ensure not less than 25 percent of the cost for a testbed awarded under this section is provided by private or non-Federal entities, including in-kind contributions.

"(2) Awards for consortia that include quantum industry participation.

"(e) ROLES AND RESPONSIBILITIES.—The Director of the National Science Foundation shall be responsible for the following:

"(1) Maintaining a record of notable outcomes from each quantum testbed established under this section.

"(2) Partnering with other Federal agencies to enable opportunities for quantum testbed outcomes to be appropriately taken up by such agencies in alignment with the missions of such agencies.

"(3) Not later than one year after the date of the enactment of this section and every two years thereafter until December 31, 2030, briefing the appropriate committees of Congress on the status of such quantum testbeds and providing recommendations for improving such quantum testbeds.

"(f) COORDINATION.—In establishing quantum testbeds under this section, the Director of the National Science Foundation shall ensure coordination with other testbeds and other quantum facilities hosting Federal quantum technology and infrastructure supported by the National Science Foundation, including those authorized pursuant to section 10390 of the Research and Development, Competition, and Innovation Act (Public Law 117–167; 42 U.S.C. 10990), or by other Federal agencies as determined appropriate by the Director, to avoid duplication and maximize use of Federal resources.

"(g) STAKEHOLDER COLLABORATION.—In carrying out this section, the Director of the National Science Foundation shall collaborate with the Quantum Consortium established pursuant to section 201(b) to accomplish the purposes of the quantum testbeds program described in subsection (b) and ensure there is strong collaboration with industry stakeholders. The Director may also engage with National Laboratories, federally funded research and develop-

ment centers, industry, and other members of the United States quantum ecosystem.

"(h) GEOGRAPHIC DIVERSITY.—The Director shall ensure regional and geographic diversity in issuing awards under this section.

"(i) FUNDING.—The Director of the National Science Foundation shall allocate up to $50,000,000 for the quantum testbeds under this section for each fiscal years 2024 through 2028, subject to the availability of appropriations. Amounts made available to carry out this section shall be derived from amounts appropriated or otherwise made available to the National Science Foundation.

"SEC. 305. RESEARCH SECURITY.

"The activities authorized under title III shall be applied in a manner consistent with subtitle D of title VI of the Research and Development, Competition, and Innovation Act (enacted as division B of Public Law 117–167; 42 U.S.C. 19231 et seq.).".

SEC. 16. DEPARTMENT OF ENERGY QUANTUM INFORMATION SCIENCE RESEARCH PROGRAM.

Section 401 of the National Quantum Initiative Act (15 U.S.C. 8851) is amended—

(1) by amending subsection (a) to read as follows:

"(a) IN GENERAL.—The Secretary of Energy shall carry out a research, development, and demonstration program on quantum information science, engineering, and technology.";

(2) in subsection (b)—

(A) in paragraph (1), by inserting ", engineering, and technology" after "science";

(B) by redesignating paragraphs (3), (4), and (5) as paragraphs (5), (6), and (7), respectively;

(C) by inserting after paragraph (2) the following new paragraphs:

"(3) operate National Quantum Information Science Research Centers to accelerate and scale up scientific and technical breakthroughs in quantum information science, engineering, and technology, and maintain state-of-the-art infrastructure for quantum researchers and industry partners, in accordance with section 402;

"(4) conduct cooperative research with industry, National Laboratories, institutions of higher education, and other research institutions to facilitate the development and demonstration of quantum information science, engineering, and technology, including in the fields of—

"(A) quantum information theory;

"(B) quantum physics;

"(C) quantum computational science, including hardware and software, including artificial intelligence, machine learning and data science;

"(D) quantum data storage, including hardware and software for energy efficient data centers;

"(E) applied mathematics and algorithm development;

"(F) quantum communications and networking, including hardware and software for quantum communications and networking;

"(G) quantum sensing and detection;

"(H) materials science and engineering;

"(I) quantum modeling and simulation, including molecular modeling;

"(J) near- and long-term application development in a range of areas as determined by the Secretary, such as materials discovery, advanced manufacturing, cybersecurity, energy efficiency and energy technologies, energy storage and electric grid management;

"(K) quantum chemistry;

"(L) quantum biology;

"(M) superconductive and high-performance microelectronics; and

"(N) quantum security technologies;";

(D) by amending paragraph (5), as so redesignated, to read as follows:

"(5) provide research experiences and training for additional undergraduate and graduate students in quantum information science, engineering, and technology, including in the fields specified in paragraph (4);";

(E) in paragraph (6), as so redesignated—

(i) in subparagraph (E), by striking "and" after the semicolon;

(ii) by redesignating subparagraph (F) as subparagraph (J); and

(iii) by inserting after subparagraph (E) the following new subparagraphs:

"(F) the Office of Electricity;

"(G) the Office of Cybersecurity, Energy Security, and Emergency Response;

"(H) the Office of Fossil Energy and Carbon Management;

"(I) the Office of Technology Transitions; and";

(F) in paragraph (7), as so redesignated, by striking the period and inserting "and other relevant efforts as defined by the Secretary of Energy; and"; and

(G) by adding at the end the following new paragraph:

"(8) leverage the collective body of knowledge and data, including experience and resources from existing Federal research activities and commercially-available quantum computing hardware and software to the extent practicable."; and

(3) by adding at the end the following:

"(c) QUANTUM HIGH PERFORMANCE COMPUTING STRATEGIC PLAN.—Not later than one year after the date of the enactment of this subsection, the Secretary of Energy shall submit to Congress a report containing a 10-year strategic plan to guide Federal programs in designing, expanding, commercializing, and procuring hybrid, high performance computing systems featuring the ability to integrate a diverse set of resources, including artificial intelligence and machine learning, accelerated by quantum supercomputers to enable the Department of Energy's computing facilities to continuously advance computing resources. Such strategic plan shall include the following:

"(1) A conceptual plan to leverage capabilities and infrastructure from the exascale computing program, as the Secretary of Energy determines necessary.

"(2) A plan to minimize disruptions to the advanced scientific computing workforce.

"(3) A consideration of a diversity of quantum computing modalities.

"(4) A plan to integrate cloud access of commercially available quantum hardware and software to complement on-premises high performance computing systems and resources consistent with the QUEST program under section 404.

"(5) Implement the plan developed under this section.

"(d) INDUSTRY OUTREACH.—In carrying out the program under subsection (a) the Secretary of Energy shall support the quantum technology industry and promote commercialization of applications of quantum technology relevant to the Department's activities by carrying out the following:

"(1) Educating—

"(A) the energy industry on near term and commercially available quantum technologies; and

"(B) the quantum industry on potential energy applications.

"(2) Accelerating the advancements of United States quantum computing, communications, networking, sensing, and security capabilities to protect and optimize the energy sector.

"(3) Advancing relevant domestic supply chains, manufacturing capabilities, and associated simulations or modeling capabilities.

"(4) Facilitating commercialization of quantum technologies from National Laboratories and engaging with the Quantum Consortium established pursuant to section 201(b) and other organizations, as applicable, to transition component technologies to help facilitate, as appropriate, the development of a quantum supply chain.

"(5) Where appropriate, promoting participation by small and medium-sized businesses and startups.

"(e) FUNDING.—Of the funds authorized to be appropriated for the Department of Energy's Office of Science pursuant to section 317 of the Department of Energy Research and Innovation Act, there is authorized to be appropriated to the Secretary to carry out the activities under

this section up to $130,000,000 for each fiscal years 2024 through 2027.".

SEC. 17. DOE QUANTUM INSTRUMENTATION AND FOUNDRY PROGRAM.

Title IV of the National Quantum Initiative Act (15 U.S.C. 8851 et seq.) is amended by inserting after section 401 the following new section:

"SEC. 401A. DEPARTMENT OF ENERGY QUANTUM INSTRUMENTATION AND FOUNDRY PROGRAM.

"(a) IN GENERAL.—The Secretary of Energy shall establish a quantum instrumentation and infrastructure foundry program to carry out the following:

"(1) Maintain United States leadership in quantum information science, engineering, and technology.

"(2) Develop domestic quantum supply chains.

"(3) Provide resources for the broader scientific community.

"(4) Support activities carried out under sections 401, 403, and 404.

"(b) PROGRAM COMPONENTS.—In carrying out the program under subsection (a), the Secretary of Energy shall design, build, develop, purchase, and commercialize specialized equipment, laboratory infrastructure, and state-of-the-art instrumentation to advance quantum engineering research and the development of quantum component tech-

nologies at a scale sufficient to meet the needs of the scientific community and enable commercialization of quantum technology.

"(c) QUANTUM FOUNDRIES.—In carrying out the program under subsection (a), and in coordination partnership with institutions of higher education and industry, the Secretary of Energy shall support the development of quantum foundries focused on meeting the device, hardware, software, and materials needs of the scientific community and the quantum supply chain.

"(d) FUNDING.—The Secretary of Energy shall allocate up to $25,000,000 for each of fiscal years 2024 through 2028 to carry out this section, subject to the availability of appropriations. Amounts made available to carry out this section shall be derived from amounts appropriated or otherwise made available to the Department of Energy's Office of Science.".

SEC. 18. NATIONAL QUANTUM INFORMATION SCIENCE RESEARCH CENTERS.

Section 402 of the National Quantum Initiative Act (15 U.S.C. 8852) is amended—

(1) in subsection (a)—

(A) in paragraph (1)—

(i) by striking "basic";

(ii) by striking "science and technology" and inserting "science, engineering, and technology, expand capacity for the domestic quantum workforce,"; and

(iii) by striking "section 401" and inserting "sections 401, 403, and 404"; and

(B) in paragraph (2)(C), by inserting "that may include one or more commercial entities" after "collaborations";

(2) in subsection (b), by inserting ", and should be inclusive of the variety of viable quantum technologies, where appropriate" before the period;

(3) in subsection (c),

(A) by striking "basic"; and

(B) by inserting ", engineering, and technology, accelerating quantum workforce development," after "science";

(4) in subsection (d)(1)—

(A) in subparagraph (C), by striking "and" after the semicolon;

(B) by redesignating subparagraph (D) as subparagraph (E); and

(C) by inserting after subparagraph (C) the following new subparagraph:

"(D) the Office of Technology Transitions; and";

(5) in subsection (e), by amending paragraph (2) to read as follows:

"(2) RENEWAL.—Each Center under this section may be renewed for an additional period of 5 years following a successful, merit-based review and approval by the Director."; and

(6) in subsection (f)—

(A) by striking "$25,000,000" and inserting "$35,000,000"; and

(B) by striking "2019 through 2023" and inserting "2024 through 2028".

SEC. 19. DEPARTMENT OF ENERGY QUANTUM NETWORK INFRASTRUCTURE RESEARCH AND DEVELOPMENT PROGRAM.

Section 403 of the National Quantum Initiative Act (15 U.S.C. 8853) is amended—

(1) in subsection (a)—

(A) in paragraph (4)—

(i) by inserting ", including" after "networking"; and

(ii) by striking "and" after the semicolon;

(B) in paragraph (5), by striking the period and inserting a semicolon; and

(C) by adding at the end the following new paragraphs:

"(6) where applicable, leverage a diversity of modalities and commercially-available quantum hardware and software; and

"(7) develop education and training pathways related to quantum network infrastructure investments, aligned with existing programmatic investments by the Department of Energy."; and

(2) in subsection (b)—

(A) in paragraph (1)—

(i) by redesignating subparagraphs (C) and (D) as subparagraphs (D) and (E), respectively; and

(ii) by inserting after subparagraph (B) the following new subparagraph:

"(C) the Administrator of the National Aeronautics and Space Administration;";

(B) in paragraph (2)—

(i) in subparagraph (A), by inserting "ground-to-space and" after "channels,";

(ii) in subparagraph (E), by striking "photon-based" and inserting "all applicable modalities of";

(iii) in subparagraph (F), by inserting ", quantum sensors," after "quantum repeaters";

(iv) in subparagraph (G)—

(I) by inserting "data centers," after "repeaters,"; and

(II) by striking "and" after the semicolon;

(v) in subparagraph (H)—

(I) by striking "the quantum technology stack" and inserting "quantum technology modality stacks"; and

(II) by striking "National Laboratories in" and inserting "National Laboratories such as"; and

(vi) by adding at the end the following new subparagraph:

"(I) development of quantum network and entanglement distribution protocols or applications, including development of network stack protocols and protocols enabling integration with existing technologies or infrastructure; and

"(J) development of high efficiency room-temperature photon detectors for quantum photonic applications, including quantum networking and communications;";

(C) in paragraph (4)—

(i) by striking "basic"; and

(ii) by striking "material" and inserting "materials"; and

(D) in paragraph (5), by striking "fundamental";

(3) in subsection (c)(6), by inserting ", including small and medium-sized businesses and startups" before the semicolon; and

(4) in subsection (d), by striking "basic research" and inserting "research, development, and demonstration".

SEC. 20. DEPARTMENT OF ENERGY QUANTUM USER EXPANSION FOR SCIENCE AND TECHNOLOGY PROGRAM.

Section 404 of the of the National Quantum Initiative Act (15 U.S.C. 8854) is amended—

(1) in subsection (a)—

(A) in the matter preceding paragraph (1), by striking "and quantum computing clouds"

and inserting ", software, and cloud-based quantum computers";

(B) in paragraph (3), by striking "and" after the semicolon;

(C) in paragraph (4), by striking the period and inserting a semicolon; and

(D) by adding at the end the following new paragraphs:

"(5) to enable development of software and applications, including estimation of resources needed to scale applications; and

"(6) to develop near-term quantum applications to solve public and private sector problems.";

(2) in subsection (b)—

(A) in paragraph (4), by striking "and" after the semicolon;

(B) in paragraph (5), by striking the period and inserting a semicolon; and

(C) by at the end the following new paragraphs:

"(6) enables users to develop algorithms, software tools, simulators, and applications for quantum systems using cloud-based quantum computers; and

"(7) partner with appropriate public and private sector entities to develop training and education opportunities on prototype and early-state devices.";

(3) in subsection (c)—

(A) by redesignating paragraphs (4), (5), (6), (7), and (8) as paragraphs (5), (6), (7), (8), and (9), respectively;

(B) by inserting after paragraph (3) the following new paragraph:

"(4) the National Oceanic and Atmospheric Administration;"; and

(C) in paragraph (7), as so redesignated, by inserting ", including small and medium-sized businesses and startups" before the semicolon; and

(4) in subsection (e)—

(A) in paragraph (4), by striking "and" after the semicolon;

(B) in paragraph (5), by striking the period and inserting "; and"; and

(C) by adding at the end the following new paragraph:

"(6) $38,000,000 for fiscal year 2028.".

SEC. 21. QUANTUM INFORMATION SCIENCE TO ENHANCE THE RESILIENCE, SECURITY, AND EFFICIENCY OF THE ELECTRIC GRID.

(a) IN GENERAL.—Title IV of the National Quantum Initiative Act (15 U.S.C. 8851 et seq.) is amended by adding at the end the following:

"SEC. 405. QUANTUM INFORMATION SCIENCE TO ENHANCE THE RESILIENCE AND SECURITY OF THE ELECTRIC GRID.

"(a) IN GENERAL.—The Secretary of Energy (referred to in this section as the 'Secretary') shall conduct research, development, and demonstration activities focused on the use of quantum information science, engineering, and technology, including through quantum applications and quantum computing, to enhance the resilience, security, and efficiency of the electric grid in the United States.

"(b) RESEARCH AREAS.—In carrying out subsection (a), the Secretary may conduct research in the following areas:

"(1) Fault detection and prediction.

"(2) Grid security and safety, including through post-quantum cryptography.

"(3) Integrated grid planning.

"(4) Grid optimization.

"(5) Enhanced modeling.

"(6) Energy storage.

"(7) Energy market optimization.

"(8) Any other area in which, in the determination of the Secretary, quantum information science, engineering, and technology can enhance the resilience, security, and efficiency of the electric grid in the United States.

"(c) COOPERATION.—To the extent practicable, the Secretary shall conduct research, development, and demonstration activities under subsection (a) in cooperation, including through partnerships, as the Secretary determines to be appropriate, with members of relevant industries, National Laboratories, institutions of higher education, and other relevant institutions, including research institutions, as determined by the Secretary.".

(b) CLERICAL AMENDMENT.—The table of contents in section 1(b) of the National Quantum Initiative Act (Public Law 115–368; 132 Stat. 5092; 136 Stat. 1441) is amended by inserting after the item relating to section 404 the following:

"Sec. 405. Quantum information science to enhance the resilience and security of the electric grid.
"Sec. 406. Research security.".

SEC. 22. RESEARCH SECURITY.

Title IV of the National Quantum Initiative Act (15 U.S.C. 8851 et seq.) is amended by adding at the end the following new section:

"SEC. 406. RESEARCH SECURITY.

"The activities authorized under title IV shall be applied in a manner consistent with subtitle D of title VI of the Research and Development, Competition, and Innovation Act (enacted as division B of Public Law 117–167; 42 U.S.C. 19231 et seq.).".

SEC. 23. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION QUANTUM ACTIVITIES.

The National Quantum Initiative Act is amended by adding at the end the following new title:

"TITLE V—NATIONAL AERONAUTICS AND SPACE ADMINISTRATION QUANTUM ACTIVITIES

"SEC. 501. QUANTUM INFORMATION SCIENCE, ENGINEERING, AND TECHNOLOGY RESEARCH FOR SPACE AND AERONAUTICS.

"(a) IN GENERAL.—The Administrator of the National Aeronautics and Space Administration is authorized to carry out research on quantum information science, engineering, and technology.

"(b) COOPERATION.—In carrying out subsection (a), the Administrator of the National Aeronautics and Space Administration—

"(1) shall consider cooperative arrangements with the Department of Energy and other Federal

Government agencies, as practicable, on areas of shared benefit; and

"(2) may enter into memoranda of understanding or memoranda of agreement to establish such cooperative arrangements.

"(c) STRATEGY.—Not later than 180 days after the date of the enactment of this title, the Administrator of the National Aeronautics and Space Administration shall submit to the appropriate committees of Congress a strategy for National Aeronautics and Space Administration research on quantum information science, engineering, and technology. The strategy shall identify resources required to support implementation of the strategy, including budgets, workforce, and infrastructure, describe cooperative efforts with other Federal Government agencies, and address areas of research and applications, including the following:

"(1) Quantum sensing.

"(2) Quantum networking.

"(3) Quantum communications, including quantum satellite communications.

"(4) Quantum computing.

"(5) Science, aeronautics, and exploration-related applications.

"(6) Any other area on quantum information, science, engineering, and technology the Administrator determines necessary.

"(d) CONSULTATION.—In developing the strategy described in subsection (c), the Administrator may seek input from relevant external stakeholders, including institutions of higher education, industry, and nonprofit research organizations.

"SEC. 502. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION QUANTUM INSTITUTE.

"(a) IN GENERAL.—Subject to the availability of appropriations, the Administrator of the National Aeronautics and Space Administration, in consultation with the heads of other Federal departments and agencies, as appropriate, may carry out a program to establish an institute focused on space and aeronautics applications of quantum information science, engineering, and technology.

"(b) INSTITUTE DETAILS.—

"(1) COMPETITIVE, MERIT-REVIEWED PROCESS.—The institute under this section shall be established through a competitive, merit-reviewed process.

"(2) APPLICATIONS.—An eligible applicant under this section shall submit to the Administrator of the National Aeronautics and Space Administration an application at such time, in such manner,

and containing such information as the Administrator determines to be appropriate.

"(3) ELIGIBLE APPLICANTS.—When administering the process described in paragraph (1), the Administrator of the National Aeronautics and Space Administration shall consider applications from institutions of higher education, research centers, multi-institutional collaborations, and any other entity that the Administrator determines to be appropriate.

"(4) COLLABORATIONS.—A collaboration that receives an award under this section may include multiple types of research institutions, private sector entities, and nonprofit organizations.

"(5) COORDINATION.—The Administrator of the National Aeronautics and Space Administration shall ensure an awardee under this section coordinates the activities carried out under this section with the National Aeronautics and Space Administration, and avoids unnecessary duplication of the existing activities of the National Aeronautics and Space Administration, other activities carried out under this Act, and other related programs, as appropriate.

"(6) COMMERCIAL TECHNOLOGY.—The institute under this section may leverage commercially-avail-

able hardware and software to carry out the activities described in subsection (c).

"(c) INSTITUTE ACTIVITIES.—The institute under this section may carry out activities that—

"(1) support research focused on developing space and aeronautics applications for quantum information science, engineering, and technology, including as related to the results of the strategy under section 501(c); and

"(2) support quantum information science, engineering, and technology education and public outreach.

"(d) INSTITUTE REQUIREMENTS.—To the maximum extent practicable, the institute under this section shall serve the needs of the National Aeronautics and Space Administration for the benefit of the broader United States quantum information science community, to create and develop processes for the purpose of advancing space and aeronautics applications in quantum information science, engineering, and technology, and improving the competitiveness of the United States.

"(e) INSTITUTE SELECTION AND DURATION.—

"(1) IN GENERAL.—Subject to the availability of appropriations, the institute under this section may carry out activities for a period of 5 years.

"(2) REAPPLICATION.—Subject to the availability of appropriations, an awardee may reapply for an additional, subsequent period of 5 years following a successful, merit-based review.

"(3) TERMINATION.—Consistent with the authorities of the National Aeronautics and Space Administration, the Administrator of the National Aeronautics and Space Administration may terminate the institute for cause during the performance period.

"SEC. 503. AUTHORIZATION OF APPROPRIATIONS.

"The Administrator of the National Aeronautics and Space Administration shall allocate up to $25,000,000 to carry out the activities authorized in sections 501 and 502 for each of fiscal years 2024 through 2028, subject to the availability of appropriations. Amounts made available to carry out sections 501 and 502 shall be derived from amounts appropriated or otherwise made available to the National Aeronautics and Space Administration.

"SEC. 504. RESEARCH SECURITY.

"The activities authorized under title V shall be applied in a manner consistent with subtitle D of title VI of the Research and Development, Competition, and Innovation Act (enacted as division B of Public Law 117–167; 42 U.S.C. 19231 et seq.).".

SEC. 24. NATIONAL SCIENCE FOUNDATION CRYPTOGRAPHY RESEARCH.

Subsection (a)(1)(A) of section 4 of the Cyber Security Research and Development Act (15 U.S.C. 7403) is amended by inserting ", including post-quantum cryptography (as such term is defined in section 3 of the Quantum Computing Cybersecurity Preparedness Act (6 U.S.C. 1526 note; Public Law 117–260))" before the semicolon.

SEC. 25. CLERICAL AMENDMENTS.

The table of contents in section 1(b) of the National Quantum Initiative Act is amended as follows:

(1) By inserting after the item relating to section 105 the following new item:

"Sec. 105A. International Quantum Cooperation Strategy.".

(2) By inserting after the item relating to section 201 the following new items:

"Sec. 202. National Institute of Standards and Technology Quantum Centers.";

(3) By inserting after the item relating to section 302 the following new items:

"Sec. 303. Quantum Reskilling, Education, and Workforce (QREW) Coordination Hub.
"Sec. 304. Quantum testbeds.".

(4) By inserting after the item relating to section 401 the following new item:

"Sec. 401A. Department of Energy Quantum Instrumentation and Foundry Program.".

(5) By adding at the end the following new items:

Union Calendar No. 510

118TH CONGRESS
2D SESSION

H. R. 6213

[Report No. 118–612]

A BILL

To reauthorize the National Quantum Initiative Act, and for other purposes.

JULY 25, 2024

Reported with an amendment, committed to the Committee of the Whole House on the State of the Union, and ordered to be printed