

1 section 10339A of the Research and Development,
2 Competition, and Innovation Act (division B of Pub-
3 lic Law 117–167; 42 U.S.C. 19039).”;

4 (3) by inserting after paragraph (4), as so re-
5 designated, the following new paragraphs:

6 “(5) FEDERAL LABORATORY.—The term ‘Fed-
7 eral laboratory’ has the meaning given such term in
8 section 4 of the Stevenson-Wydler Technology Inno-
9 vation Act of 1980 (15 U.S.C. 3703).

10 “(6) FOREIGN COUNTRY OF CONCERN.—The
11 term ‘foreign country of concern’ has the meaning
12 given such term in section 10638 of the Research
13 and Development, Competition, and Innovation Act
14 (division B of Public Law 117–167; 42 U.S.C.
15 19237).

16 “(7) FOREIGN ENTITY OF CONCERN.—The
17 term ‘foreign entity of concern’ has the meaning
18 given such term in section 10638 of the Research
19 and Development, Competition, and Innovation Act
20 (division B of Public Law 117–167; 42 U.S.C.
21 19237).”;

22 (4) in paragraph (8), as so redesignated, by
23 striking “section 1001(a)” and inserting “section
24 1001”;

1 (5) by inserting after paragraph (8), as so re-
2 designated, the following new paragraph:

3 “(9) NATIONAL LABORATORY.—The term ‘Na-
4 tional Laboratory’ has the meaning given such term
5 in section 2 of the Energy Policy Act of 2005 (42
6 U.S.C. 15801).”;

7 (6) by inserting after paragraph (10), as so re-
8 designated, the following new paragraphs:

9 “(11) QUANTUM APPLICATIONS.—The term
10 ‘quantum applications’ means applications that use
11 quantum information science, engineering, and tech-
12 nology, including quantum algorithms and software,
13 quantum computing and quantum-classical hybrids,
14 quantum sensing, quantum networking, quantum
15 encryption, or quantum communications applica-
16 tions.

17 “(12) QUANTUM COMPUTING.—The term ‘quan-
18 tum computing’ means any of a variety of quantum
19 computing technologies, including quantum anneal-
20 ing and quantum gate-model systems that utilize a
21 variety of qubit architectures, such as super-
22 conducting, ion traps, photonics, neutral atoms,
23 atomic spin, electron spin, or topological qubits.”;

24 (7) by amending paragraph (13), as so redesign-
25 nated, to read as follows:

1 “(13) QUANTUM INFORMATION SCIENCE, ENGI-
2 NEERING, AND TECHNOLOGY.—The term ‘quantum
3 information science, engineering, and technology’
4 means the understanding, translation, use, or appli-
5 cation of the laws of quantum physics for the stor-
6 age, transmission, manipulation, computing, simula-
7 tion, or measurement of information.”; and

8 (8) by inserting after paragraph (14), as so re-
9 designated, the following new paragraph:

10 “(15) STEM.—The term ‘STEM’ means the
11 academic and professional disciplines of science,
12 technology, engineering, and mathematics, including
13 computer science.”.

14 **SEC. 5003. PURPOSES.**

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

17 (1) in the matter preceding paragraph (1), by
18 striking “science and its technology applications”
19 and inserting “science, engineering, and technology”;

20 (2) in paragraph (1)—

21 (A) in the matter preceding subparagraph
22 (A), by striking “science and technology” and
23 inserting “science, engineering, and tech-
24 nology”;

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

3 “(A) to expand the number of researchers,
4 educators, and students with training in quan-
5 tum information science, engineering, and tech-
6 nology to develop domestic workforce pathways
7 and retain international talent to the extent
8 consistent with national security and inter-
9 national competitiveness;”;

10 (C) in subparagraph (B), by striking
11 “science at the” and inserting “science, engi-
12 neering, and technology at the primary, sec-
13 ondary,”;

14 (D) in subparagraph (C), by striking
15 “basic”;

16 (E) in subparagraph (D)—

17 (i) by striking “science and tech-
18 nology” and inserting “science, engineer-
19 ing, and technology”; and

20 (ii) by striking “and” after the semi-
21 colon; and

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

24 “(F) to support development of quantum
25 applications, including quantum-hybrid applica-

1 tions, to promote innovation and commercializa-
2 tion; and

3 “(G) to support other emerging tech-
4 nologies that could benefit from or benefit the
5 development of quantum technology and pro-
6 mote research, development, demonstration, and
7 application of such technologies in quantum in-
8 formation science, engineering, and tech-
9 nology.”;

10 (3) in paragraph (2), by striking “science and
11 technology” and inserting “science, engineering, and
12 technology”;

13 (4) in paragraph (3), by striking “science and
14 technology” and inserting “science, engineering, and
15 technology”;

16 (5) in paragraph (4)—

17 (A) by inserting “National Laboratories,”
18 after “Federal laboratories,”; and

19 (B) by striking “and” after the semicolon;

20 (6) in paragraph (5)—

21 (A) in the matter preceding subparagraph

22 (A)—

23 (i) by inserting “partnerships, re-
24 search collaborations, and” after “inter-
25 national”; and

1 (ii) by striking “science and tech-
2 nology security” and inserting “science,
3 engineering, and technology”;

4 (B) in subparagraph (A)—

5 (i) by inserting “, social benefit,”
6 after “innovation”; and

7 (ii) by striking “and” after the semi-
8 colon;

9 (C) in subparagraph (B), by striking the
10 period and inserting “; and”; and

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

13 “(C) to facilitate cooperative investment in
14 quantum capabilities between the United States
15 and its allies and partners to strengthen and se-
16 cure the domestic supply chain and related eco-
17 system; and”;

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

20 “(6) improving the maturity, scale, and short-
21 and long-term viability of the quantum technology
22 industry, including small and medium-sized busi-
23 nesses and startups representing a diversity of quan-
24 tum specialties, and commercialization of domestic
25 quantum capacity across modalities.”.

1 **SEC. 5004. NATIONAL QUANTUM INITIATIVE PROGRAM.**

2 Subsection (b) of section 101 of the National Quan-
3 tum Initiative Act (15 U.S.C. 8811) is amended—

4 (1) in paragraph (1)—

5 (A) by striking “development” and insert-
6 ing “research development, and near- and me-
7 dium-term, and long-term demonstration”;

8 (B) by striking “information science and
9 technology”; and

10 (C) by inserting “in diverse sectors” after
11 “applications”;

12 (2) in paragraph (2)—

13 (A) by striking “fundamental”;

14 (B) by striking “science and technology”
15 and inserting “science, engineering, and tech-
16 nology”; and

17 (C) by inserting “infrastructure,” after
18 “demonstration,”;

19 (3) in paragraph (3)—

20 (A) by striking “science and technology”
21 and inserting “science, engineering, and tech-
22 nology”; and

23 (B) by striking “pipeline” and inserting
24 “pathway”;

25 (4) by amending paragraph (4) to read as fol-
26 lows:

1 “(4) provide for interagency planning and co-
2 ordination of Federal quantum information science,
3 engineering, and technology research, development,
4 demonstration, standards engagement, and other ac-
5 tivities under the Program, including activities au-
6 thorized pursuant to section 234 of the John S.
7 McCain National Defense Authorization Act for Fis-
8 cal Year 2019 (10 U.S.C. 4001 note), quantum edu-
9 cational activities and programs authorized pursuant
10 to section 10661 of the Research and Development,
11 Competition, and Innovation Act (42 U.S.C. 19261),
12 and activities conducted at any Federal laboratory;”;
13 and

14 (5) in paragraph (5)—

15 (A) by striking “industry and universities”
16 and inserting “industry, universities, nonprofit
17 research organizations, and strategic allies”;
18 and

19 (B) by inserting “, including human re-
20 sources” after “resources”.

21 **SEC. 5005. NATIONAL QUANTUM COORDINATION OFFICE.**

22 Section 102 of the National Quantum Initiative Act
23 (15 U.S.C. 8812) is amended—

1 (1) in subparagraph (A) of subsection (a)(2),
2 by inserting “, and who shall serve a four year term,
3 subject to renewal” before the semicolon; and

4 (2) in subsection (b)—

5 (A) in paragraph (3)—

6 (i) by striking “science and tech-
7 nology” and inserting “science, engineer-
8 ing, and technology research and work-
9 force”; and

10 (ii) by inserting “, nonprofit research
11 organizations,” after “universities”;

12 (B) by amending paragraph (4) to read as
13 follows:

14 “(4) ensure coordination among the collabo-
15 rative ventures or consortia established under this
16 Act;”;

17 (C) in paragraph (6), by striking “and”
18 after the semicolon;

19 (D) in paragraph (7)—

20 (i) by inserting “nonprofit research
21 organizations,” after “universities,”; and

22 (ii) by striking the period at the end
23 and inserting a semicolon; and

24 (E) by adding at the end the following new
25 paragraphs:

1 “(8) promote understanding and adoption of
2 quantum capabilities throughout the United States
3 economy, as appropriate; and

4 “(9) track and promote policies that will ensure
5 stability of the United States quantum workforce,
6 quantum supply chain, domestic quantum industry,
7 and international trade.”.

8 **SEC. 5006. SUBCOMMITTEE ON QUANTUM INFORMATION**
9 **SCIENCE.**

10 Section 103 of the National Quantum Initiative Act
11 (15 U.S.C. 8813) is amended—

12 (1) in subsection (b)—

13 (A) in paragraph (8), by striking “and”
14 after the semicolon;

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

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

19 “(9) the Department of Health and Human
20 Services;

21 “(10) the Department of State;

22 “(11) the Department of Homeland Security;

23 “(12) the National Oceanic and Atmospheric
24 Administration;

25 “(13) the Department of Education; and”;

1 (2) in subsection (d)—

2 (A) in paragraph (1), by striking “the
3 quantum information science and technology re-
4 search” and inserting “quantum information
5 science, engineering, and technology research
6 and quantum application development, dem-
7 onstration, and commercialization”;

8 (B) in paragraph (4), by inserting “, engi-
9 neering, and technology” after “science”;

10 (C) in paragraph (5),

11 (i) by inserting “, engineering, and
12 technology” after “science”; and

13 (ii) by inserting “, and conduct com-
14 parative benchmarking of Federal invest-
15 ments and research strategies relative to
16 the investments and research strategies of
17 the United States’ strategic partners and
18 other countries” after “development ef-
19 forts”;

20 (D) in paragraph (6)—

21 (i) by striking “science and tech-
22 nology” and inserting “science, engineer-
23 ing, and technology”; and

24 (ii) by striking “and” after the semi-
25 colon;

1 (E) in paragraph (7)—

2 (i) by inserting “, engineering and
3 technology” after “science”; and

4 (ii) by striking the period and insert-
5 ing a semicolon; and

6 (F) by adding at the end the following new
7 paragraphs:

8 “(8) facilitate interagency partnership opportu-
9 nities to advance quantum applications related to
10 the environment, oceans and coastal systems, ad-
11 vanced manufacturing, biotechnology, space, and
12 other sectors; and

13 “(9) facilitate interagency partnership opportu-
14 nities to support the innovation, entrepreneurial,
15 educational, and research capacity of geographic re-
16 gions with strength in quantum-related fields and in-
17 dustries to address, in partnership with industry,
18 universities, small businesses, and strategic allies
19 and partners, regional, national, societal, or
20 geostrategic challenges.”;

21 (3) in subsection (h)(2)(A), by inserting “, in-
22 cluding a description of agency roles and responsibil-
23 ities” before the period; and

24 (4) by adding at the end the following new sub-
25 sections:

1 “(i) QUANTUM USE CASES.—

2 “(1) IN GENERAL.—The Subcommittee shall
3 identify potential use cases with respect to which
4 quantum computing could advance the missions of
5 participating agencies, including through on-prem-
6 ises, cloud-based, hybrid, or networked approaches.

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

12 “(3) REPORTING.—The Subcommittee, as part
13 of the annual report on the budget for the Program
14 under subsection (g), shall report progress in car-
15 rying out the activities under this section, including
16 information relating to the following:

17 “(A) The potential use cases identified
18 pursuant to paragraph (1).

19 “(B) The status of plans developed pursu-
20 ant to paragraph (2).

21 “(C) Any obstacles to implementing
22 such—

23 “(i) potential use cases; or

24 “(ii) plans.

1 “(j) INTERAGENCY COORDINATION REGARDING HE-
2 LIUM-3 FOR QUANTUM COMPUTING INFRASTRUCTURE
3 AND INDUSTRY AND THE DOMESTIC HELIUM-3 SUPPLY
4 CHAIN.—The Subcommittee shall—

5 “(1) include in coordination activities of such
6 Subcommittee, as appropriate, the identification of
7 Federal agency helium-3 requirements for quantum
8 computing infrastructure; and

9 “(2) facilitate information sharing between
10 Federal agencies regarding helium-3 demand projec-
11 tions and supply vulnerabilities.”.

12 **SEC. 5007. NATIONAL QUANTUM INITIATIVE ADVISORY**
13 **COMMITTEE.**

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

16 (1) by amending subsection (b) to read as fol-
17 lows:

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

21 “(1) representative of industry, including end
22 users likely to benefit from quantum technology and
23 small and medium-sized businesses and startups rep-
24 resenting a diversity of quantum specialties, univer-

1 sities, nonprofit research organizations, and Federal
2 laboratories; and

3 “(2) qualified to provide advice and information
4 on quantum information science, engineering, and
5 technology research, development, demonstrations,
6 standards, STEM education, technology transfer,
7 commercial application, or national security and eco-
8 nomic concerns.”;

9 (2) in subsection (d)(2)—

10 (A) in subparagraph (A), by striking
11 “science and technology” and inserting
12 “science, engineering, and technology”;

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

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

18 “(D) other countries’ quantum programs
19 and the progress of such countries and such
20 programs relative to the Program;”;

21 (D) in subparagraph (E), as so redesign-
22 nated—

23 (i) by striking “to” and inserting
24 “promote innovation, foster a robust

1 United States quantum industry, and”;
2 and

3 (ii) by striking “science and tech-
4 nology” and inserting “science, engineer-
5 ing, and technology”; and

6 (E) in subparagraph (F), as so redesign-
7 dated, by inserting “, including to address any
8 gaps that may exist” before the semicolon;

9 (F) in subparagraph (G), as so redesign-
10 dated, by striking “open standards for, quan-
11 tum information science and technology; and”
12 and inserting “international standards in open
13 and transparent standardization systems for
14 quantum information science, engineering, and
15 technology;”;

16 (G) in subparagraph (H), as so redesign-
17 dated—

18 (i) by inserting “educational, environ-
19 mental, health,” after “legal,”; and

20 (ii) by striking the period and insert-
21 ing a semicolon; and

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

24 “(I) the domestic and international co-
25 operation needs and goals of the Program, in-

1 including needs and goals related to infrastruc-
2 ture and the supply chain of quantum informa-
3 tion science, engineering, and technology; and

4 “(J) the degree to which quantum infor-
5 mation science, engineering, and technology is
6 enhancing or can enhance the capabilities of the
7 United States advanced industrial economy and
8 protect or optimize critical infrastructure (as
9 such term is defined in section 1016(e) of Pub-
10 lic Law 107–56 (42 U.S.C. 5195c(e)).”;

11 (3) in subsection (e), by inserting “through De-
12 cember 31, 2030” after “thereafter”;

13 (4) by amending subsection (g) to read as fol-
14 lows:

15 “(g) FACA EXEMPTION.—The President shall char-
16 ter the Advisory Committee in accordance with chapter 10
17 of title 5, United States Code (commonly referred to as
18 the ‘Federal Advisory Committee Act’), except that the
19 Advisory Committee shall be exempt from section 1013
20 of such title.”; and

21 (5) by adding at the end the following new sub-
22 section:

23 “(h) INTERAGENCY COORDINATION REGARDING HE-
24 LIUM–3 FOR QUANTUM COMPUTING INFRASTRUCTURE
25 AND INDUSTRY AND THE DOMESTIC HELIUM–3 SUPPLY

1 CHAIN.—The Advisory Committee shall, in the exercise of
2 its advisory functions, consider the state of the domestic
3 helium–3 supply chain as such relates to the long-term
4 viability and competitiveness of the United States quan-
5 tum computing industry, and may include findings and
6 recommendations regarding helium–3 supply chain secu-
7 rity in the reports of such Committee to the President
8 and”.

9 **SEC. 5008. SUBCOMMITTEE ON THE ECONOMIC AND SECU-**
10 **RITY IMPLICATIONS OF QUANTUM INFORMA-**
11 **TION SCIENCE.**

12 Section 105 of the National Quantum Initiative Act
13 (15 U.S.C. 8814a) is amended—

14 (1) in subsection (b)—

15 (A) in paragraph (10), by striking “and”
16 after the semicolon;

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

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

21 “(11) the Department of Health and Human
22 Services;

23 “(12) the Department of State;

24 “(13) the National Aeronautics and Space Ad-
25 ministration; and”;

1 (2) in subsection (c)—

2 (A) in paragraph (1)—

3 (i) by striking “Office and Manage-
4 ment and Budget” and inserting “Office of
5 Management and Budget”; and

6 (ii) by striking “information science”
7 and inserting “information science, engi-
8 neering, and technology”;

9 (B) in paragraph (2), by inserting “or to
10 supply chains” before the semicolon;

11 (C) in paragraph (3), by inserting “or sup-
12 ply chains” before the semicolon;

13 (D) in paragraph (5), by inserting “and
14 engineering” after “quantum information
15 science”;

16 (E) in paragraph (6), by striking “infor-
17 mation science” and inserting “information
18 science, engineering, and technology”;

19 (F) in paragraph (7), by striking “and”
20 after the semicolon;

21 (G) in paragraph (8), by striking the pe-
22 riod and inserting a semicolon; and

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

1 “(9) in coordination with the Subcommittee on
2 Quantum Information Science, identify opportunities
3 to increase coordination between civilian, military,
4 and intelligence quantum research entities, reduce
5 unnecessary duplicative quantum research activities,
6 and facilitate collaboration between quantum re-
7 search agencies with specialized capabilities or ex-
8 pertise in one or more aspects of quantum informa-
9 tion science, engineering, or technology; and

10 “(10) recommend strategies for attracting and
11 retaining students and scholars with expertise in
12 quantum-related fields to Federal departments and
13 agencies.”.

14 **SEC. 5009. INTERNATIONAL QUANTUM COOPERATION**
15 **STRATEGY.**

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

18 **“SEC. 105A. INTERNATIONAL QUANTUM COOPERATION**
19 **STRATEGY.**

20 “(a) STRATEGY REQUIRED.—Not later than one year
21 after the date of the enactment of this section, the Direc-
22 tor of the Office of Science and Technology Policy, in con-
23 sultation with the Secretary of Commerce, the Secretary
24 of State, the Secretary of Energy, the Director of the Na-
25 tional Science Foundation, the Administrator of the Na-

1 tional Aeronautics and Space Administration, and the
2 heads of other Federal agencies, as appropriate, shall sub-
3 mit to the Committee on Commerce, Science, and Trans-
4 portation, the Committee on Energy and Natural Re-
5 sources, and the Committee on Foreign Relations of the
6 Senate, and the Committee on Science, Space, and Tech-
7 nology and the Committee on Foreign Affairs of the
8 House of Representatives a strategy to carry out the fol-
9 lowing:

10 “(1) Establish collaborative international part-
11 nerships, including co-funded international pro-
12 grams, to advance research and development, testing
13 and evaluation, commercialization, and interoper-
14 ability in quantum information science, engineering,
15 and technology with allies and partners of the
16 United States, and other countries, when in the se-
17 curity, strategic, technological, and scientific inter-
18 ests of the United States.

19 “(2) Ensure continued United States participa-
20 tion in bilateral and multilateral efforts to advance
21 quantum information science, engineering, and tech-
22 nology on the international stage.

23 “(3) Promote the integrity and impartiality of
24 international standards organizations and processes

1 related to quantum information science, engineering,
2 and technology.

3 “(4) Ensure ethical application of quantum in-
4 formation science, engineering, and technology to
5 protect civil liberties and basic human rights.

6 “(b) DESIGNATION.—The strategy under subsection
7 shall be known as the ‘International Quantum Cooperation
8 Strategy’ (in this section referred to as the ‘Strategy’).

9 “(c) ELEMENTS.—In the development of the Strat-
10 egy, the Director of the Office of Science and Technology
11 Policy, the National Quantum Coordination Office, the
12 Subcommittee on Quantum Information Science, the Sub-
13 committee on the Economic and Security Implications,
14 and other appropriate Federal agencies should consider
15 the following:

16 “(1) The establishment of international part-
17 nerships to advance research and development in
18 quantum information science, engineering, and tech-
19 nology.

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

24 “(3) Efforts and plans to address risks to the
25 national security or economic interests of the United

1 States during development or deployment of quan-
2 tum technologies worldwide, including plans for dip-
3 lomatic engagement with allies and partners, and
4 other countries.

5 “(4) Efforts and plans to promote responsible
6 global development and deployment of quantum
7 technologies, including through international engage-
8 ment and leadership in the development of inter-
9 national standards.

10 “(5) Efforts and plans to develop, attract, and
11 retain international talent.

12 “(6) The ability and risks of domestic manufac-
13 turers and suppliers and those of allies and partners
14 of the United States to satisfy the needs of the glob-
15 al quantum supply chain, including raw materials
16 such as Helium-3, plans for engagement with allies
17 and partners, manufacturers, and suppliers, and op-
18 tions to mitigate gaps and vulnerabilities in the glob-
19 al quantum supply chain.

20 “(7) A plan to safeguard research and tech-
21 nology supported through international cooperation,
22 as appropriate, in whole or in part, including in
23 quantum technologies critical to national security,
24 from malign influence, theft, or exfiltration by for-
25 eign entities of concern.

1 “(8) As necessary, a description of such legisla-
2 tive or administrative action needed to carry out the
3 Strategy.

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

8 **SEC. 5010. SUNSET.**

9 Subsection (a) of section 106 of the National Quan-
10 tum Initiative Act (15 U.S.C. 8815) is amended by strik-
11 ing “the date that is 11 years after the date of enactment
12 of this Act” and inserting “December 30, 2032”.

13 **SEC. 5011. NATIONAL INSTITUTE OF STANDARDS AND**
14 **TECHNOLOGY ACTIVITIES AND QUANTUM**
15 **CONSORTIUM.**

16 Section 201 of the National Quantum Initiative Act
17 (15 U.S.C. 8831) is amended—

18 (1) in subsection (a)—

19 (A) in paragraph (1)—

20 (i) by striking “basic and applied”;

21 and

22 (ii) by striking “science and tech-
23 nology” and inserting “science, engineer-
24 ing, and technology”;

25 (B) in paragraph (2)—

1 (i) by inserting “attract, educate,
2 and” before “train”; and

3 (ii) by striking “science and tech-
4 nology” and inserting “science, engineer-
5 ing, and technology”;

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

8 “(3) shall carry out research to facilitate the
9 development and standardization of quantum cryp-
10 tography, post-quantum cryptography (as such term
11 is defined in section 3 of the Quantum Computing
12 Cybersecurity Preparedness Act (6 U.S.C. 1526
13 note; Public Law 117–260)), and practices to re-
14 place cryptographic keys or algorithms with minimal
15 disruption to current applications and systems;”.

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

18 “(4) shall carry out research, development, and
19 demonstration projects, as appropriate, to facilitate
20 the development and standardization of quantum
21 networking, communications, computing, metrology,
22 sensing technologies and quantum applications, in-
23 cluding supply chain enabling technologies and other
24 supporting technologies;”.

1 (E) by redesignating paragraphs (5), (6),
2 and (7) as paragraphs (8), (9), and (13), re-
3 spectively;

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

6 “(5) shall carry out, in coordination with the
7 Director of the Defense Advanced Research Projects
8 Agency, research to support the measurement of
9 comparative performance and progress of quantum
10 technologies, including, as practicable, technology
11 readiness assessments of quantum technologies;

12 “(6) shall promote United States participation
13 in international standards organizations related to
14 quantum information science, engineering, and tech-
15 nology;

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

18 “(A) accelerate the development of domes-
19 tic quantum supply chain and supply chain-sup-
20 porting technologies; and

21 “(B) reduce quantum supply chain
22 vulnerabilities;”;

23 (G) in paragraph (8), as so redesignated,
24 by striking “infrastructure” and inserting “,
25 communications, sensing, and computing”;

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

2 (i) by inserting “nonprofit research
3 organizations,” after “universities,”; and

4 (ii) by striking “and engineering;
5 and” and inserting “, engineering, and
6 technology, and expanding the domestic
7 STEM workforce;”; and

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

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

12 “(11) shall establish guidance for the interoper-
13 ability, portability, testing, evaluation, verification,
14 validation, and security of quantum software and
15 software supply chains;

16 “(12) shall support best practices and evalua-
17 tion methods for the security of quantum software
18 supply chains, including with respect to—

19 “(A) open-source development; and

20 “(B) provenance; and”;

21 (2) in subsection (b)—

22 (A) in paragraph (1)—

23 (i) by striking “future” and inserting
24 “research”; and

1 (ii) by striking “science and tech-
2 nology” and inserting “science, engineer-
3 ing, and technology”;

4 (B) in paragraph (2)—

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

7 “(A) to gather and assess information on
8 the quantum industry to address the needs
9 identified in paragraph (1);”;

10 (ii) by striking subparagraphs (B) and
11 (C) and inserting the following new sub-
12 paragraphs:

13 “(B) to provide recommendations regard-
14 ing how the National Institute of Standards
15 and Technology, the Program, and other Fed-
16 eral agencies, as appropriate, can address the
17 gaps in the research necessary to satisfy the
18 needs identified in paragraph (1) and accelerate
19 real-world uses of quantum information science,
20 engineering, and technology;

21 “(C) to identify enabling technologies and
22 the relevant supply chain essential to foster re-
23 search and industrial competitiveness in quan-
24 tum information science, engineering, and tech-
25 nology, and communicate findings to Federal

1 agencies and other domestic and international
2 stakeholders; and

3 “(D) to assess and identify key areas for
4 establishing, expanding, or developing inter-
5 national partnerships that will facilitate United
6 States quantum-related business engagement.”;

7 (C) in paragraph (3)—

8 (i) by striking “Not later than 2 years
9 after the date of enactment of this Act,
10 the” and inserting “The”; and

11 (ii) by inserting “periodically, but not
12 less frequently than once every five years,”
13 after “shall”; and

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

16 “(4) COORDINATION.—As appropriate, Federal
17 agencies specified in section 103(b) that—

18 “(A) are involved in the transition or
19 translation of practical quantum applications,
20 or

21 “(B) have a mission that could benefit
22 from the development of quantum technologies,
23 may engage with the consortium to inform and ac-
24 celerate progress in such applications or tech-
25 nologies, as the case may be.”; and

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

3 “(c) INTERNATIONAL QUANTUM RESEARCH AND ME-
4 TROLOGY.—

5 “(1) IN GENERAL.—The Director of the Na-
6 tional Institute of Standards and Technology, in co-
7 ordination with the Secretary of State and the Di-
8 rector of the National Science Foundation, shall
9 support international quantum information science,
10 engineering, and technology research, metrology re-
11 search, and standardization, as appropriate, to en-
12 hance international cooperation, satisfy United
13 States commitments, and support United States en-
14 gagement in international standards for quantum in-
15 formation science, engineering, and technology.

16 “(2) ALIGNMENT.—In carrying out this section,
17 the Director of the National Institute of Standards
18 and Technology shall ensure alignment with the Na-
19 tional Quantum Information Science Strategy and
20 the U.S. Government National Standards Strategy
21 for Critical and Emerging Technology, or successor
22 strategies.

23 “(3) RESTRICTIONS.—

24 “(A) CONFUCIUS INSTITUTES.—None of
25 the funds made available under this section

1 may be obligated or expended to an institution
2 of higher education that maintains a contract
3 or agreement between such institution and a
4 Confucius Institute or any successor of a Con-
5 fucius Institute.

6 “(B) FOREIGN COUNTRIES OF CONCERN
7 OR ENTITIES OF CONCERN.—None of the funds
8 made available under this section may be obli-
9 gated or expended to promote, establish, or fi-
10 nance quantum research activities between a
11 United States entity and a foreign country of
12 concern or foreign entity of concern, except
13 such restriction shall not apply to participation
14 by awardees in consensus-based international
15 standardization activities.

16 “(d) POST QUANTUM CRYPTOGRAPHY DEPLOY-
17 MENT.—

18 “(1) IN GENERAL.—The Director of the Na-
19 tional Institute of Standards and Technology, in
20 consultation with the Secretary of Homeland Secu-
21 rity, the heads of Sector Risk Management Agencies
22 (as such term is defined in section 2200 of the
23 Homeland Security Act of 2002 (6 U.S.C. 650)),
24 and private sector entities, as appropriate, shall pro-
25 mote the voluntary development, adoption, and de-

1 ployment of standards relating to post-quantum
2 cryptography (as such term is defined in section 3
3 of the Quantum Computing Cybersecurity Prepared-
4 ness Act (6 U.S.C. 1526 note; Public Law 117–
5 260)), including by carrying out the following:

6 “(A) Disseminating and making publicly
7 available guidance and resources to help organi-
8 zations adopt and deploy standards relating to
9 post-quantum cryptography and minimize dis-
10 ruptions to current applications and systems
11 caused by cryptographic updates.

12 “(B) Providing technical assistance, as
13 practicable, to entities that are at high risk of
14 quantum cryptoanalytic attacks, such as State
15 and local governments, entities determined to
16 be critical infrastructure (as such term is de-
17 fined in section 1016(e) of Public Law 107–56
18 (42 U.S.C. 5195c(e))) or digital infrastructure
19 providers.

20 “(C) Conducting such other activities as
21 determined necessary by the Director to pro-
22 mote the development, adoption, and deploy-
23 ment across the United States of standards re-
24 lating to post-quantum cryptography.

25 “(2) GRANT PROGRAM.—

1 “(A) IN GENERAL.—Subject to the avail-
2 ability of appropriations, the Director of the
3 National Institute of Standards and Technology
4 may establish a program to identify and provide
5 technical assistance through the award of
6 grants to entities that are at high risk of quan-
7 tum cryptanalytic attacks, including by award-
8 ing grants for the adoption of such standards
9 and the remediation of quantum-related
10 vulnerabilities.

11 “(B) USE OF FUNDS.—Grants awarded to
12 entities under this paragraph may be used to
13 cover reasonable costs, up to a specified amount
14 established by the Director of the National In-
15 stitute of Standards and Technology, for activi-
16 ties to adopt standards relating to post-quantum
17 cryptography and remediate quantum-re-
18 lated vulnerabilities, including with respect to
19 technology transitions to satisfy post quantum
20 cryptography standards for entities at high risk
21 of quantum cryptanalytic attacks.

22 “(C) GUIDANCE.—The Director of the Na-
23 tional Institute of Standards and Technology
24 may develop, and periodically update, guidance,
25 including relating to eligibility, application dis-

1 closure requirements, grant amount and dura-
2 tion, and any additional requirements regarding
3 the award of grants under this paragraph.

4 “(D) CONSULTATION.—If the grant pro-
5 gram described in this paragraph is established,
6 the Director of the National Institute of Stand-
7 ards and Technology shall consult with the Di-
8 rector of the Cybersecurity and Infrastructure
9 Security Agency of the Department of Home-
10 land Security, the heads of other Sector Risk
11 Management Agencies, State and local govern-
12 ments, and appropriate representatives of pri-
13 vate sector entities, including nonprofit organi-
14 zations, to share information regarding such
15 grant program and guidance developed and up-
16 dated under subparagraph (C).”.

17 **SEC. 5012. NATIONAL INSTITUTE OF STANDARDS AND**
18 **TECHNOLOGY QUANTUM ACCELERATION**
19 **CENTERS.**

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

22 **“SEC. 202. NATIONAL INSTITUTE OF STANDARDS AND**
23 **TECHNOLOGY QUANTUM ACCELERATION**
24 **CENTERS.**

25 “(a) ESTABLISHMENT.—

1 “(1) IN GENERAL.—Subject to the availability
2 of appropriations, the Director of the National Insti-
3 tute of Standards and Technology, in consultation
4 with the heads of other Federal departments and
5 agencies, as appropriate, shall carry out a program
6 to establish at least one, but not more than three,
7 centers to accelerate research, development, deploy-
8 ment, and standardization of quantum information
9 science, engineering, and technology.

10 “(2) PROGRAM DETAILS.—

11 “(A) COMPETITIVE, MERIT-REVIEWED
12 PROCESS.—The centers described in paragraph
13 (1) shall be established through a competitive,
14 merit-reviewed process.

15 “(B) APPLICATIONS.—An eligible applicant
16 described in subparagraph (C) shall submit to
17 the Director of the National Institute of Stand-
18 ards and Technology an application at such
19 time, in such manner, and containing such in-
20 formation as the Director determines to be ap-
21 propriate.

22 “(C) ELIGIBLE APPLICANTS.—Eligible ap-
23 plicants described in this subparagraph are the
24 following:

25 “(i) Institutions of higher education.

1 “(ii) Nonprofit organizations.

2 “(iii) Multi-institutions collaborations,
3 including multiple types of research insti-
4 tutions, private sector entities, small busi-
5 ness concerns (as such term is defined
6 under section 3 of the Small Business Act
7 (15 U.S.C. 632)), Federal laboratories,
8 and nonprofit organizations, or a consortia
9 thereof.

10 “(iv) Any other entity the Director de-
11 termines appropriate.

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

17 “(A) Quantum sensing and measurement
18 technologies.

19 “(B) Advancing the manufacturing and
20 scale-up of quantum systems and quantum ena-
21 bling technologies.

22 “(C) Address technology barriers to quan-
23 tum networking and communications.

24 “(D) Quantum engineering.

1 “(b) REQUIREMENTS.—To the maximum extent
2 practicable, centers established under this section shall
3 serve the mission of the National Institute of Standards
4 and Technology, for the benefit of the broader United
5 States quantum information science community, to de-
6 velop processes for the following purposes:

7 “(1) Advancing research and standardization in
8 quantum information science, engineering, and tech-
9 nology.

10 “(2) Advancing technology development.

11 “(3) Improving the competitiveness of the
12 United States.

13 “(c) COORDINATION.—The Director of the National
14 Institute of Standards and Technology shall ensure coordi-
15 nation, and avoid unnecessary duplication of, the activities
16 carried out under this section with existing activities of
17 the Institute, other activities carried out under this Act,
18 and other related programs, as appropriate.

19 “(d) SELECTION AND DURATION.—

20 “(1) IN GENERAL.—The centers established
21 under this section are authorized to carry out activi-
22 ties for a period of five years.

23 “(2) RENEWAL.—Each center established under
24 this section may be renewed for additional periods of

1 five years following a successful merit-based review
2 by the Director.

3 “(3) **TERMINATION.**—Consistent with the au-
4 thorities of the National Institute of Standards and
5 Technology, the Director of the National Institute of
6 Standards and Technology may terminate an under-
7 performing center for cause during the performance
8 period.

9 **“SEC. 203. RESEARCH SECURITY.**

10 “The activities authorized under title II shall be ap-
11 plied in a manner consistent with subtitle D of title VI
12 of the Research and Development, Competition, and Inno-
13 vation Act (enacted as division B of Public Law 117–167;
14 42 U.S.C. 19231 et seq.).”

15 **SEC. 5013. NATIONAL SCIENCE FOUNDATION QUANTUM IN-**
16 **FORMATION SCIENCE RESEARCH AND EDU-**
17 **CATION ACTIVITIES.**

18 Section 301 of the National Quantum Initiative Act
19 (15 U.S.C. 8841) is amended—

20 (1) in the heading, by inserting “, **ENGINEER-**
21 **ING, AND TECHNOLOGY**” after “**SCIENCE**”;

22 (2) in subsection (a)—

23 (A) by striking “basic”; and

1 (B) by striking “science and engineering”
2 and inserting “science, engineering, and tech-
3 nology”;

4 (3) in subsection (b)—

5 (A) in paragraph (1)—

6 (i) in subparagraph (A)—

7 (I) by striking “basic”; and

8 (II) by striking “science and en-
9 gineering” and inserting “science, en-
10 gineering, and technology”; and

11 (ii) in subparagraph (B)—

12 (I) by striking “human re-
13 sources” and inserting “education and
14 workforce”; and

15 (II) by striking “science and en-
16 gineering” and inserting “science, en-
17 gineering, and technology”; and

18 (B) in paragraph (2)—

19 (i) in subparagraph (A)—

20 (I) in clause (i)—

21 (aa) by striking “science and
22 engineering” and inserting
23 “science, engineering, and tech-
24 nology”;

1 (bb) by inserting “K–12, vo-
2 cational,” before “under-
3 graduate”; and

4 (cc) by striking “and” after
5 the semicolon;

6 (II) in clause (ii), by inserting
7 “and” after the semicolon; and

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

10 “(iii) to pursue research at the fron-
11 tiers of quantum information science, engi-
12 neering, and technology, and explore solu-
13 tions to important challenges for the devel-
14 opment, application, and commercialization
15 of quantum technologies;”;

16 (ii) in subparagraph (B), by striking
17 “science and engineering” and inserting
18 “science, engineering, and technology”;
19 and

20 (iii) in subparagraph (C), by striking
21 “science and engineering” and inserting
22 “science, engineering, and technology”;

23 (iv) in subparagraph (D), by striking
24 “and” after the semicolon;

1 (v) in subparagraph (E), by striking
2 the period and inserting a semicolon; and
3 (vi) by adding at the end the following
4 new subparagraphs:

5 “(F) providing infrastructure to support
6 academic quantum information science, engi-
7 neering, and technology, including through ex-
8 isting infrastructure programs and new activi-
9 ties; and

10 “(G) supporting, in collaboration with the
11 Secretary of Commerce and Secretary of En-
12 ergy, regional innovation initiatives in quantum
13 information science, engineering, and tech-
14 nology, and the adoption of viable quantum ca-
15 pabilities, which may include the activities car-
16 ried out pursuant to an award of funds under
17 section 10388 of the Research and Develop-
18 ment, Competition, and Innovation Act (Public
19 Law 117–167; 42 U.S.C. 19108).”;

20 (4) by amending subsection (c) to read as fol-
21 lows:

22 “(c) STUDENT TRAINEESHIPS, FELLOWSHIPS, AND
23 OTHER MODELS.—

24 “(1) IN GENERAL.—The Director of the Na-
25 tional Science Foundation, in consultation with

1 heads of Federal agencies the Director considers ap-
2 propriate, shall make awards to institutions of high-
3 er education or eligible nonprofit organizations (or
4 consortia thereof) to increase capacity and broaden
5 participation, including through provisioning of expe-
6 riential opportunities, where appropriate, in quan-
7 tum information science, engineering, and tech-
8 nology and other related disciplines.

9 “(2) QUANTUM TRAINEESHIPS.—The Director
10 of the National Science Foundation may establish or
11 use existing programs to make awards to institu-
12 tions of higher education or nonprofit organizations
13 (or consortia thereof) to provide traineeships to
14 graduate students at institutions of higher education
15 within the United States who are citizens of the
16 United States and who choose or plan to pursue
17 masters or doctoral degrees in quantum information
18 science, engineering, and technology, or related
19 fields, and by providing students with opportunities
20 for research experiences in government or industry
21 related to such students’ quantum studies.

22 “(3) QUANTUM FELLOWSHIPS AND SCHOLAR-
23 SHIPS.—

24 “(A) IN GENERAL.—The Director of the
25 National Science Foundation may establish or

1 use existing programs to support fellowships
2 and scholarships for students at institutions of
3 higher education for the purpose of increasing
4 quantum information science, engineering, and
5 technology exposure for undergraduate and
6 graduate STEM students and increasing post-
7 graduation employment opportunities for
8 STEM students.

9 “(B) REQUIREMENTS.—Eligible partici-
10 pants in the fellowship and scholarship program
11 shall—

12 “(i) be enrolled in or have graduated
13 from a STEM degree program at a domes-
14 tic institution of higher education; and

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

18 “(C) CONSIDERATIONS.—Eligible fellow-
19 ships and scholarships may include temporary
20 quantum-related positions at Federal or State
21 agencies, National Laboratories, private sector
22 entities, institutions of higher education, the
23 quantum centers and institute established in
24 sections 202, 302, 402, and 502, or other quan-

1 tum-relevant entities, as determined appropriate
2 by the Director.

3 “(D) COMPETITIVE AWARDS.—Fellowships
4 and scholarships shall be competitively awarded
5 through a merit-review process. The Director of
6 the National Science Foundation may prioritize
7 fellowships that include an industry partner
8 that provides financial assistance to the appli-
9 cant for direct or indirect costs.

10 “(4) QUANTUM RESEARCH EXPERIENCES FOR
11 UNDERGRADUATES.—The Director of the National
12 Science Foundation shall seek to increase opportuni-
13 ties for quantum research for undergraduate stu-
14 dents by encouraging proposals in quantum informa-
15 tion science, engineering, and technology, through
16 the research experiences for undergraduates pursu-
17 ant to section 514 of the America COMPETES Re-
18 authorization Act of 2010 (42 U.S.C. 1862p-6).

19 “(5) CO-OPERATIVE EDUCATION PROGRAMS.—
20 The Director of the National Science Foundation
21 may establish or use existing programs to support
22 cooperative education programs between institutions
23 of higher education and employers that increase op-
24 portunities for undergraduate students to acquire
25 experiential learning and professional experiences in

1 quantum information sciences, engineering, and
2 technology.

3 “(6) PARTNERSHIPS.—In carrying out the ac-
4 tivities under this subsection, the Director of the
5 National Science Foundation shall encourage award-
6 ees to partner with relevant Federal agencies, Fed-
7 eral laboratories, industry and other private sector
8 organizations, and nonprofit organizations to facili-
9 tate the expansion of workforce pathways and
10 hands-on learning experiences.”;

11 (5) in subsection (d)—

12 (A) in the subsection heading, by striking
13 “QISE” and inserting “QISET”;

14 (B) in paragraph (1)—

15 (i) by striking “information science
16 and engineering (referred to in this sub-
17 section as ‘QISE’)” and inserting “infor-
18 mation science, engineering, and tech-
19 nology (referred to in this subsection as
20 QISET)”;

21 (ii) by inserting “and career and tech-
22 nical education entities” after “colleges”;

23 (C) in paragraph (2)—

1 (i) in subparagraph (A), by striking
2 “QISE” and inserting “quantum informa-
3 tion science, engineering, and technology”;

4 (ii) in subparagraph (D), by inserting
5 “, engineering, and technology” after
6 “science”;

7 (iii) in subparagraph (D), by inserting
8 “, including materials relevant to emerging
9 technologies” before the period;

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

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

15 “(E) Informal education methods to en-
16 hance experiences of students of all ages with
17 quantum information science, engineering, and
18 technology concepts and applications.”;

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

22 “(G) Methods to introduce into STEM
23 curricula security and other potential societal
24 dimensions associated with quantum informa-
25 tion science, engineering, and technology.”; and

1 (vii) in subparagraph (H), as so re-
2 designated, by inserting “, engineering,
3 and technology” after “science”;

4 (D) in paragraph (3), by striking “QISE”
5 and inserting “quantum information science,
6 engineering, and technology”; and

7 (E) by striking paragraph (4); and

8 (6) by adding at the end the following new sub-
9 sections:

10 “(e) QUANTUM RESEARCH EXPERIENCES FOR
11 TEACHERS.—The Director of the National Science Foun-
12 dation shall seek to increase opportunities to engage edu-
13 cators, principals, or other school leaders of K-12 students
14 in professional learning opportunities to enhance quantum
15 information science, engineering, and technology knowl-
16 edge, including by carrying out the following:

17 “(1) Providing hands-on training and research
18 opportunities at Federal Laboratories, institutions of
19 higher education, or in industry for such educators,
20 principals, or other school leaders.

21 “(2) Developing best practices.

22 “(f) EXPANDING CAPACITY IN QUANTUM INFORMA-
23 TION SCIENCE, ENGINEERING, AND TECHNOLOGY
24 (QISET).—

1 “(1) IN GENERAL.—The Director of the Na-
2 tional Science Foundation, in consultation with the
3 heads of Federal agencies the Director considers ap-
4 propriate, shall make awards on a competitive,
5 merit-reviewed basis to eligible institutions of higher
6 education or eligible nonprofit organizations (or con-
7 sortia thereof) to increase research capacity, edu-
8 cation and infrastructure capacity, and broaden par-
9 ticipation in quantum information science, engineer-
10 ing, and technology and related disciplines, including
11 by carrying out the following:

12 “(A) Supporting curriculum development
13 in quantum information science, engineering,
14 and technology as described in subsection (d).

15 “(B) Building upon the activities carried
16 out under the Next Generation Quantum Lead-
17 ers Pilot Program authorized under section
18 10661(f) of the Research and Development,
19 Competition, and Innovation Act (Public Law
20 117–167; 42 U.S.C. 19261(f)).

21 “(C) Leveraging the readiness for the in-
22 volvement of local research and education com-
23 munities to secure talent pathways in quantum
24 information science, engineering, and tech-

1 nology to satisfy the workforce needs of indus-
2 try, government, and academia.

3 “(2) COLLABORATIONS.—The Director of the
4 National Science Foundation shall—

5 “(A) require eligible institutions of higher
6 educations or eligible nonprofit organizations to
7 describe how such an institute or organization,
8 as the case may be, plans to partner with one
9 or more relevant private sector entities; and

10 “(B) may require such an institute or or-
11 ganization, as the case may be, to provide a let-
12 ter of support from any such entities.

13 “(3) REQUIREMENTS.—To receive an award
14 under this subsection, an eligible institution of high-
15 er education or eligible nonprofit organization, as
16 the case may be, shall submit to the Director of the
17 National Science Foundation an application that in-
18 cludes the following:

19 “(A) A plan to sustain proposed activities
20 beyond the duration of the award.

21 “(B) Proposed quantum information
22 science, engineering, and technology disciplines
23 or focus areas such eligible institution or orga-
24 nization, as the case may be, is prepared to en-
25 gage in to significantly build up its quantum in-

1 formation science, engineering, and technology
2 research and education capacity.

3 “(C) A plan for education and workforce
4 development, which may include K-12 and post-
5 secondary education programs and activities,
6 workforce training and career and technical
7 education programs and activities, under-
8 graduate, graduate, and postdoctoral education,
9 and informal education programs and activities.

10 “(4) ACTIVITIES.—Awards under this sub-
11 section to support research and related activities
12 may include the activities relating to the following:

13 “(A) Development or expansion of research
14 programs in disciplines and focus areas speci-
15 fied in paragraph (4)(B).

16 “(B) Faculty recruitment and professional
17 development in such disciplines and focus areas.

18 “(C) To build research capacity and infra-
19 structure at an eligible institution in such dis-
20 ciplines and focus areas.

21 “(D) An assessment of capacity-building
22 and research infrastructure needs identified in
23 such paragraph.

24 “(E) Bridge programs focused on pre-
25 paring post-baccalaureate students for graduate

1 programs in quantum information science, engi-
2 neering, and technology.

3 “(F) Administrative research development
4 support.

5 “(G) Other activities necessary to build re-
6 search capacity in quantum information science,
7 engineering, and technology.

8 “(5) ADDITIONAL CONSIDERATIONS.—In mak-
9 ing awards under this subsection, the Director of the
10 National Science Foundation may also consider the
11 following:

12 “(A) The extent to which the eligible insti-
13 tution of higher education or eligible nonprofit
14 organization, as the case may be, will support
15 students from diverse backgrounds, including
16 first-generation undergraduate students.

17 “(B) The geographic and institutional di-
18 versity of eligible institutions of higher edu-
19 cation and eligible nonprofit organizations.

20 “(C) How the eligible institution of higher
21 education or eligible nonprofit organization, as
22 the case may be, can leverage public-private
23 partnerships and existing research partnerships
24 with Federal agencies.

1 “(6) DUPLICATION.—The Director of the Na-
2 tional Science Foundation shall ensure awards made
3 under this subsection are complementary to and not
4 duplicative of existing programs.

5 “(7) ELIGIBLE INSTITUTION OF HIGHER EDU-
6 CATION DEFINED.—In this subsection, the term ‘eli-
7 gible institution of higher education’ means an insti-
8 tution of higher education, that, according to the
9 data published by the National Center for Science
10 and Engineering Statistics, is not, on average,
11 among the top 100 institutions in Federal research
12 and development expenditures during the 3- year pe-
13 riod prior to the year of the award.

14 “(g) FACULTY MID-CAREER DEVELOPMENT
15 AWARDS.—The Director of the National Science Founda-
16 tion may provide awards to support mid-career scientists
17 and faculty to upgrade, develop, or acquire essential re-
18 search instruments to start new research activities, or ex-
19 pand existing activities, focused on quantum information
20 science, engineering and technology.

21 “(h) INTERNATIONAL RESEARCH ON QUANTUM IN-
22 FORMATION SCIENCE, ENGINEERING, AND TECH-
23 NOLOGY.—

24 “(1) IN GENERAL.—The Director of the Na-
25 tional Science Foundation, in coordination with the

1 Secretary of State and the Secretary of Commerce,
2 shall support international quantum information
3 science, engineering, and technology research col-
4 laboration, as appropriate, to enhance international
5 cooperation and satisfy United States commitments,
6 including pursuant to bilateral or multilateral quan-
7 tum information science, engineering, and tech-
8 nology research agreements.

9 “(2) ALIGNMENT.—In carrying out this sub-
10 section, the Director of the National Science Foun-
11 dation shall ensure alignment with the strategy for
12 national quantum information science in accordance
13 with Executive Order 14073 (87 Fed. Reg. 27909;
14 relating to enhancing the National Quantum Advi-
15 sory Committee) or successor strategies.

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

20 “(4) RESTRICTION.—None of the funds made
21 available under this section may be obligated or ex-
22 pended to an institution of higher education that
23 maintains a contract or agreement between such in-
24 stitution and a Confucius Institute or any successor
25 of a Confucius Institute.

1 “(i) UPGRADING AND IMPROVING ACCESS TO QUAN-
2 TUM RESEARCH RESOURCES.—

3 “(1) IN GENERAL.—In carrying out the activi-
4 ties described in this section, the Director of the Na-
5 tional Science Foundation, in consultation with the
6 heads of other Federal departments and agencies, as
7 appropriate, shall make awards to institutions of
8 higher education or eligible nonprofit organizations
9 (or consortia thereof) to upgrade research facilities
10 and improve access to research resources, such as
11 equipment and instrumentation, that is needed for
12 research and development in quantum information
13 science, engineering, and technology.

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

18 “(A) Upgrading or adding research re-
19 sources to accelerate the development of quan-
20 tum technologies, including capabilities focused
21 on addressing the roadblocks to implementa-
22 tion, and satisfy the materials, advanced mate-
23 rials development, high performance computing,
24 heterogeneous computing, networking, software,
25 data, clean room, and device needs of the sci-

1 entific community and the quantum supply
2 chain.

3 “(B) Enhancing access to equipment and
4 instrumentation, including at partnering insti-
5 tutions, by facilitating information sharing, co-
6 ordination, scheduling, education, and training,
7 including activities that provide meaningful
8 hands-on learning experiences for students, in-
9 cluding at community and technical colleges.

10 “(C) Enabling professional staff to support
11 the operation and improvement of research re-
12 sources used for quantum information science,
13 engineering, and technology.

14 “(3) REQUIREMENTS.—An institution of higher
15 education or an eligible nonprofit organization (or a
16 consortium thereof) and industry partners seeking
17 funding under this subsection shall submit to the
18 Director of the National Science Foundation an ap-
19 plication at such time, in such manner, and con-
20 taining such information as the Director may re-
21 quire.”.

22 **SEC. 5014. MULTIDISCIPLINARY CENTERS FOR QUANTUM**
23 **RESEARCH AND EDUCATION.**

24 Section 302 of the National Quantum Initiative Act
25 (15 U.S.C. 8842) is amended—

1 (1) in subsection (a), by striking “5” and in-
2 serting “10”;

3 (2) in subsection (c)—

4 (A) in the matter preceding paragraph (1),
5 by striking “basic”;

6 (B) in paragraph (1), by striking “science
7 and engineering” and inserting “science, engi-
8 neering, and technology, including by con-
9 tinuing to advance enabling fields, such as
10 mathematics, materials science, fabrication
11 science, and physics”;

12 (C) in paragraph (2), by striking “and en-
13 gineering” and inserting “, engineering, and
14 technology, including leveraging or expanding
15 activities established pursuant to section
16 301(d)”; and

17 (D) in paragraph (3), by striking “fos-
18 tering innovation by bringing” and inserting
19 “fostering domestic innovation and accelerating
20 technology transfer by bringing”

21 (3) in subsection (d)(2)—

22 (A) in subparagraph (A), by inserting
23 “quantum information science, engineering, and
24 technology” after “quantum science”;

1 (B) in subparagraph (B), by inserting
2 “health, ocean science,” after “chemistry,”;

3 (C) in subparagraph (C), by inserting “,
4 including how each institution of higher edu-
5 cation or an eligible nonprofit organization (or
6 a consortium thereof), as the case may be, that
7 is applying for a grant under this section will
8 develop and implement outreach activities to in-
9 crease the participation of students in STEM,
10 including women and individuals from under-
11 represented groups (in accordance with section
12 526(a)(7) of the America COMPETES Reau-
13 thorization Act of 2010 (42 U.S.C. 1862p-
14 14(a)(7)))” before the semicolon;

15 (D) in subparagraph (D), by striking
16 “and” after the semicolon;

17 (E) in subparagraph (E), by striking the
18 period and inserting “; and”; and

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

21 “(F) how the Center will participate in
22 international collaborations, as appropriate, to
23 build a trusted global research network with al-
24 lies and partners of the United States and
25 other countries that share values with the

1 United States, including respect for inter-
2 national norms and a commitment to fair com-
3 petition.”;

4 (4) in paragraph (2) of subsection (e), by strik-
5 ing “on a competitive” and inserting “following a
6 successful”.

7 (5) in subsection (f), by striking “2019 through
8 2023” and inserting “2027”.

9 **SEC. 5015. QUANTUM RESKILLING, EDUCATION, AND WORK-**
10 **FORCE (QREW) COORDINATION HUB.**

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

14 **“SEC. 303. QUANTUM RESKILLING, EDUCATION, AND WORK-**
15 **FORCE (QREW) COORDINATION HUB.**

16 “(a) IN GENERAL.—The Director of the National
17 Science Foundation, in consultation with the Director of
18 the National Institute of Standards and Technology, the
19 Secretary of Energy, and the heads of other relevant Fed-
20 eral departments and agencies, as appropriate, shall make
21 an award to a consortium led by an institution of higher
22 education or an eligible nonprofit organization to establish
23 a Quantum Reskilling, Education, and Workforce Coordi-
24 nation Hub (in this section referred to as the ‘Hub’).

1 “(b) CONSORTIUM.—The Hub established pursuant
2 to subsection (a) shall include not fewer than four institu-
3 tions of higher education, including not fewer than two
4 community colleges, and may include career and technical
5 schools, nonprofit organizations, and private sector enti-
6 ties.

7 “(c) PURPOSE.—The purpose of this Hub shall be the
8 following:

9 “(1) To identify and address cross-cutting
10 workforce development challenges in quantum infor-
11 mation science, engineering, and technology, and the
12 quantum industry, by serving as a national and re-
13 gional clearinghouse.

14 “(2) To facilitate the establishment of programs
15 to disseminate to institutions of higher education
16 and career and technical education entities model
17 curricula, best practices, and instructional materials.

18 “(d) ACTIVITIES.—The activities of the Hub may in-
19 clude the following:

20 “(1) Testing, implementing, scaling, dissemi-
21 nating, and standardizing materials, methods, best
22 practices, and other outputs developed through ac-
23 tivities under this Act.

24 “(2) Increasing the integration of quantum in-
25 formation science, engineering, and technology con-

1 tent into STEM curricula at all education levels, in-
2 cluding career and technical education programs.

3 “(3) Providing opportunities for STEM degree
4 students to provide feedback on quantum informa-
5 tion science, engineering, and technology curricula.

6 “(4) Facilitating post-education employment
7 opportunities and workforce pathways for STEM de-
8 gree recipients in quantum-related industries, includ-
9 ing by facilitating opportunities for internships,
10 externships, fellowships, and other such activities as
11 determined by the Director, including through the
12 establishment of a publicly accessible online portal.

13 “(5) Coordinating with quantum industry and
14 nonprofit entities and small and medium-sized busi-
15 nesses and startups to inform and enhance the qual-
16 ity and availability of quantum education in STEM
17 degree programs, including through the promotion of
18 post-graduation opportunities for STEM students
19 outside the classroom to increase exposure to quan-
20 tum industries.

21 “(6) Supporting activities and programs to en-
22 hance the recruitment of students in STEM, includ-
23 ing women and individuals from underrepresented
24 groups (in accordance with section 526(a)(7) of the
25 America COMPETES Reauthorization Act of 2010

1 (42 U.S.C. 1862p-14(a)(7))), to pursue under-
2 graduate and graduate studies in quantum informa-
3 tion science, engineering, or technology.

4 “(7) Developing, testing, implementing, and co-
5 ordinating career development programs and strate-
6 gies for pre-university and university educators for
7 the purpose of increasing the number of quantum-
8 informed educators at all levels of education, includ-
9 ing by carrying out the following:

10 “(A) Hosting career development work-
11 shops.

12 “(B) Developing in-house and distance
13 learning career development tools for public
14 use.

15 “(C) Facilitating access to related quan-
16 tum technology, tools, and resources.

17 “(D) Developing training, research, and
18 professional development programs, including
19 innovative pre-service and in-service programs.

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

24 “(8) Establishing a framework for performing
25 ongoing regular data collection and analysis for the

1 quantum workforce to report on trends, and perform
2 other activities that expand the understanding of the
3 current and future needs of the quantum industry,
4 and education capacity or readiness of the quantum
5 workforce. Such activities shall complement or align
6 with, as relevant, authorized quantum and STEM
7 workforce studies under section 10661(d) of the Re-
8 search and Development, Competition, and Innova-
9 tion Act (42 U.S.C. 19261(d)).

10 “(9) Facilitating public education and outreach
11 activities to enhance the understanding and aware-
12 ness of quantum information science, engineering,
13 and technology to a boarder community to satisfy
14 broader impact requirements of award applications.

15 “(10) Encouraging coordination on quantum
16 education in the broader STEM community.

17 “(e) QREW QUANTUM FELLOWSHIP PROGRAM.—
18 Subject to the restriction specified in subsection (h)(4) of
19 section 301, the Hub may support education or policy fel-
20 lowships for students at entities participating in the con-
21 sortium under subsection (a) or at other research centers
22 established pursuant to this Act at the National Science
23 Foundation, the National Institute of Standards and
24 Technology, the Department of Energy, or the National

1 Aeronautics and Space Administration, for the purpose of
2 supporting the activities described in subsection (d).

3 “(f) INDUSTRY COORDINATION.—The Hub shall col-
4 laborate with the Quantum Consortium established in sec-
5 tion 201(b) or other industry consortia to identify, pub-
6 lish, facilitate, or enable quantum-related education and
7 workforce development opportunities described in sub-
8 sections (c) and (d).

9 “(g) APPLICATION.—A consortium seeking funding
10 under this section shall submit to the Director of the Na-
11 tional Science Foundation an application at such time, in
12 such manner, and containing such information as the Di-
13 rector may require. Each application shall include a de-
14 scription of how the consortium shall carry out the fol-
15 lowing:

16 “(1) Contribute to the success of the Hub and
17 fulfill the purposes of the Hub.

18 “(2) Include industry participation in fulfilling
19 the purposes of the Hub.

20 “(3) Collaborate with other members of the
21 consortium to share expertise in integrating quan-
22 tum information science, engineering, and tech-
23 nology into existing STEM programs and other rel-
24 evant fields and disciplines.

1 “(4) Support long-term and short-term work-
2 force development in the quantum field.

3 “(5) Develop and implement outreach activities
4 to increase the participation of students in STEM,
5 including women and individuals from underrep-
6 resented groups (in accordance with section
7 526(a)(7) of the America COMPETES Reauthoriza-
8 tion Act of 2010 (42 U.S.C. 1862p-14(a)(7))).

9 “(h) SELECTION AND DURATION.—

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

13 “(2) REAPPLICATION.—An awardee may re-
14 apply for an additional, subsequent period of 5 years
15 following a successful, merit-based review.

16 “(3) TERMINATION.—Consistent with the au-
17 thorities of the National Science Foundation, the Di-
18 rector of the National Science Foundation may ter-
19 minate the Hub if it is underperforming during the
20 performance period.

21 “(i) COORDINATION.—The Hub shall coordinate with
22 other research centers established under this Act at the
23 National Science Foundation, the National Institute of
24 Standards and Technology, the Department of Energy,
25 the National Aeronautics and Space Administration, and

1 other relevant Federal agencies, as appropriate, on activi-
2 ties and resources.

3 **“SEC. 304. QUANTUM TESTBEDS.**

4 “(a) IN GENERAL.—Not later than one year after the
5 date of the enactment of the National Quantum Initiative
6 Reauthorization Act, the Director of the National Science
7 Foundation, in coordination with the Director of the Na-
8 tional Institute of Standards and Technology, the Sec-
9 retary of Energy, and the heads of other Federal agencies,
10 as determined appropriate by the Director of the National
11 Science Foundation, shall make awards on a competitive,
12 merit-reviewed basis to institutions of higher education,
13 nonprofit organizations, federally funded research and de-
14 velopment centers, or consortia thereof, to establish not
15 more than five testbeds for quantum applications research
16 and development.

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

24 “(c) APPLICATION PROPOSALS.—An applicant for an
25 award under this section shall submit to the Director a

1 proposal at such time, in such manner, and containing
2 such information as the Director may reasonably require.

3 The proposal shall, at a minimum, describe the following:

4 “(1) How the applicant will assemble a work-
5 force, including women and individuals from under-
6 represented groups (in accordance with section
7 526(a)(7) of the America COMPETES Reauthoriza-
8 tion Act of 2010 (42 U.S.C. 1862p-14(a)(7))), with
9 the skills needed to operate a quantum testbed.

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

13 “(3) How the applicant will securely research
14 and develop software that is interoperable, portable,
15 and cross-modal, including with respect to
16 benchmarking and reproducibility.

17 “(4) How a quantum testbed will operate after
18 Federal funding has ended.

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

21 “(1) Applicants that ensure not less than 25
22 percent of the cost for a testbed awarded under this
23 section is provided by private or non-Federal enti-
24 ties, including in-kind contributions.

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

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

6 “(1) Maintaining a record of notable outcomes
7 from each quantum testbed established under this
8 section.

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

13 “(3) Not later than one year after the date of
14 the enactment of this section and every two years
15 thereafter until December 31, 2032, briefing the ap-
16 propriate committees of Congress on the status of
17 such quantum testbeds and providing recommenda-
18 tions for improving such quantum testbeds.

19 “(f) COORDINATION.—In establishing quantum
20 testbeds under this section, the Director of the National
21 Science Foundation shall ensure coordination with other
22 testbeds and other quantum facilities hosting Federal
23 quantum technology and infrastructure supported by the
24 National Science Foundation, including testbeds author-
25 ized pursuant to section 10390 of the Research and Devel-

1 opment, Competition, and Innovation Act (Public Law
2 117–167; 42 U.S.C. 19110), or by other Federal agencies
3 as determined appropriate by the Director, to avoid dupli-
4 cation and maximize use of Federal resources.

5 “(g) **STAKEHOLDER COLLABORATION.**—In carrying
6 out this section, the Director of the National Science
7 Foundation shall collaborate with the Quantum Consor-
8 tium established pursuant to section 201(b) to accomplish
9 the purposes of the quantum testbeds program described
10 in subsection (b) and ensure there is strong collaboration
11 with industry stakeholders. The Director may also engage
12 with National Laboratories, federally funded research and
13 development centers, industry, and other members of the
14 United States quantum ecosystem.

15 “(h) **GEOGRAPHIC DIVERSITY.**—The Director shall
16 ensure regional and geographic diversity in issuing awards
17 under this section.

18 “(i) **PUBLICATION.**—An entity that establishes a
19 testbed under subsection (a) is encouraged to publish non-
20 proprietary software artifacts and benchmark results from
21 such testbed if such publication would not compromise the
22 security of such software or such testbed.

23 **“SEC. 305. RESEARCH SECURITY.**

24 “The activities authorized under title III shall be ap-
25 plied in a manner consistent with subtitle D of title VI

1 of the Research and Development, Competition, and Inno-
2 vation Act (enacted as division B of Public Law 117–167;
3 42 U.S.C. 19231 et seq.).”.

4 **SEC. 5016. DEPARTMENT OF ENERGY QUANTUM INFORMA-**
5 **TION SCIENCE RESEARCH PROGRAM.**

6 Section 401 of the National Quantum Initiative Act
7 (15 U.S.C. 8851) is amended—

8 (1) in subsection (a), by striking “basic re-
9 search program on quantum information science”
10 and inserting “research, development, and dem-
11 onstration program on quantum information science,
12 engineering, and technology”;

13 (2) in subsection (b)—

14 (A) in paragraph (1), by inserting “, engi-
15 neering, and technology” after “science”;

16 (B) by redesignating paragraphs (3), (4),
17 and (5) as paragraphs (5), (6), and (7), respec-
18 tively;

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

21 “(3) operate National Quantum Information
22 Science Research Centers to accelerate and scale up
23 scientific and technical breakthroughs in quantum
24 information science, engineering, and technology,
25 and maintain state-of-the-art infrastructure for

1 quantum researchers and industry partners, in ac-
2 cordance with section 402;

3 “(4) conduct cooperative research with indus-
4 try, National Laboratories, institutions of higher
5 education, and other research institutions to facili-
6 tate the development and demonstration of quantum
7 information science, engineering, and technology, in-
8 cluding in the fields of—

9 “(A) quantum information theory;

10 “(B) quantum physics;

11 “(C) quantum computational science, in-
12 cluding hardware and software, including artifi-
13 cial intelligence, machine learning and data
14 science;

15 “(D) quantum data storage, including
16 hardware and software for energy efficient data
17 centers;

18 “(E) applied mathematics and algorithm
19 development;

20 “(F) quantum communications and net-
21 working, including hardware and software for
22 quantum communications and networking;

23 “(G) quantum sensing and detection;

24 “(H) materials science and engineering;

1 “(I) quantum modeling and simulation, in-
2 cluding molecular modeling;

3 “(J) near- and long-term application devel-
4 opment in a range of areas as determined by
5 the Secretary, such as materials discovery, ad-
6 vanced manufacturing, cybersecurity, energy ef-
7 ficiency and energy technologies, energy storage
8 and electric grid management;

9 “(K) quantum chemistry and chemical
10 sciences;

11 “(L) quantum biology; and

12 “(M) quantum security technologies;”;

13 (D) by amending paragraph (5), as so re-
14 designated, to read as follows:

15 “(5) provide research experiences and training
16 for additional undergraduate and graduate students
17 in quantum information science, engineering, and
18 technology, including in the fields specified in para-
19 graph (4);”;

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

21 (i) in subparagraph (E), by striking
22 “and” after the semicolon;

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

1 (iii) by inserting after subparagraph

2 (E) the following new subparagraphs:

3 “(F) the Office of Electricity;

4 “(G) the Office of Cybersecurity, Energy
5 Security, and Emergency Response;

6 “(H) the Office of Fossil Energy and Car-
7 bon Management;

8 “(I) the Office of Technology Transitions;
9 and”;

10 (F) in paragraph (7), as so redesignated,
11 by striking the period and inserting “ and other
12 relevant efforts as defined by the Secretary of
13 Energy;”; and

14 (G) by adding at the end the following new
15 paragraphs:

16 “(8) leverage the collective body of knowledge
17 and data, including experience and resources from
18 existing Federal research activities and commer-
19 cially-available quantum computing hardware and
20 software to the extent practicable; and

21 “(9) support, in collaboration with the Sec-
22 retary of Commerce and Director of the National
23 Science Foundation, regional innovation initiatives
24 in quantum information science, engineering, and
25 technology, including quantum industry and non-

1 profit entities and small and medium-sized busi-
2 nesses and startups.”; and

3 (3) by adding at the end the following new sub-
4 sections:

5 “(c) QUANTUM HIGH PERFORMANCE COMPUTING
6 STRATEGIC PLAN.—Not later than one year after the date
7 of the enactment of this subsection, the Secretary of En-
8 ergy shall submit to Congress a report containing a 10-
9 year strategic plan to guide Federal programs in design-
10 ing, expanding, commercializing, and procuring hybrid,
11 high performance computing systems featuring the ability
12 to integrate a diverse set of resources, including artificial
13 intelligence and machine learning, accelerated by quantum
14 supercomputers to enable the Department of Energy’s
15 computing facilities to continuously advance computing re-
16 sources. Such strategic plan shall include the following:

17 “(1) A plan to leverage capabilities and infra-
18 structure from the exascale computing program, as
19 the Secretary determines necessary.

20 “(2) A plan to minimize disruptions to the ad-
21 vanced scientific computing workforce.

22 “(3) A consideration of a diversity of quantum
23 computing modalities.

24 “(4) A plan to integrate cloud access of com-
25 mercially available quantum hardware and software

1 to complement on-premises high performance com-
2 puting systems and resources consistent with the
3 QUEST program under section 404.

4 “(5) A description of how the Secretary will im-
5 plement the plan developed under this section.

6 “(d) INDUSTRY OUTREACH.—In carrying out the
7 program under subsection (a) the Secretary of Energy
8 shall engage with the quantum technology industry and
9 promote commercialization of applications of quantum
10 technology relevant to the Department of Energy’s activi-
11 ties by carrying out the following:

12 “(1) Educating the following:

13 “(A) The energy industry on near term
14 and commercially available quantum tech-
15 nologies.

16 “(B) The quantum industry on potential
17 energy applications.

18 “(2) Accelerating the advancements of United
19 States quantum computing, communications, net-
20 working, sensing, and security capabilities to protect
21 and optimize the energy sector.

22 “(3) Advancing relevant domestic supply
23 chains, manufacturing capabilities, and associated
24 simulations or modeling capabilities.

1 “(4) Facilitating commercialization of quantum
2 technologies from National Laboratories and engag-
3 ing with the Quantum Consortium established pur-
4 suant to section 201(b) and other organizations, as
5 applicable, to transition component technologies to
6 help facilitate, as appropriate, the development of a
7 quantum supply chain.

8 “(5) Where appropriate, promoting participa-
9 tion by small and medium-sized businesses and
10 startups.”.

11 **SEC. 5017. DOE QUANTUM INSTRUMENTATION AND FOUN-**
12 **DRY PROGRAM.**

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

16 **“SEC. 401A. DEPARTMENT OF ENERGY QUANTUM INSTRU-**
17 **MENTATION AND FOUNDRY PROGRAM.**

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

21 “(1) Maintain United States leadership in
22 quantum information science, engineering, and tech-
23 nology.

24 “(2) Develop domestic quantum supply chains.

- 1 (A) in paragraph (1)—
- 2 (i) by striking “basic”;
- 3 (ii) by striking “science and tech-
- 4 nology” and inserting “science, engineer-
- 5 ing, and technology, to expand capacity for
- 6 the domestic quantum workforce,”; and
- 7 (iii) by striking “section 401” and in-
- 8 serting “sections 401, 403, and 404”; and
- 9 (B) in paragraph (2)(C), by inserting
- 10 “that may include one or more commercial enti-
- 11 ties” after “collaborations”;
- 12 (2) in subsection (b), by inserting “, and should
- 13 be inclusive of the variety of viable quantum tech-
- 14 nologies, where appropriate” before the period;
- 15 (3) in subsection (c),
- 16 (A) by striking “basic”; and
- 17 (B) by inserting “, engineering, and tech-
- 18 nology, accelerating quantum workforce devel-
- 19 opment,” after “science”;
- 20 (4) in subsection (d)(1)—
- 21 (A) in subparagraph (C), by striking
- 22 “and” after the semicolon;
- 23 (B) by redesignating subparagraph (D) as
- 24 subparagraph (E); and

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

3 “(D) the Office of Technology Transitions;
4 and”;

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

7 “(2) RENEWAL.—Each Center under this sec-
8 tion may be renewed for an additional period of 5
9 years following a successful, merit-based review and
10 approval by the Director.”; and

11 (6) by striking subsection (f).

12 **SEC. 5019. DEPARTMENT OF ENERGY QUANTUM NETWORK**
13 **INFRASTRUCTURE RESEARCH AND DEVELOP-**
14 **MENT PROGRAM.**

15 Section 403 of the National Quantum Initiative Act
16 (15 U.S.C. 8853) is amended—

17 (1) in subsection (a)—

18 (A) in paragraph (4)—

19 (i) by inserting “, including” after
20 “networking”; and

21 (ii) by striking “and” after the semi-
22 colon;

23 (B) in paragraph (5), by striking the pe-
24 riod and inserting a semicolon; and

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

3 “(6) where applicable, leverage a diversity of
4 modalities and commercially-available quantum
5 hardware and software; and

6 “(7) develop education and training pathways
7 related to quantum network infrastructure invest-
8 ments, aligned with existing programmatic invest-
9 ments by the Department of Energy.”; and

10 (2) in subsection (b)—

11 (A) in paragraph (1)—

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

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

17 “(C) the Administrator of the National
18 Aeronautics and Space Administration;”;

19 (B) in paragraph (2)—

20 (i) in subparagraph (A), by inserting
21 “ground-to-space and” after “channels,”;

22 (ii) in subparagraph (E), by striking
23 “photon-based” and inserting “all applica-
24 ble modalities of”;

25 (iii) in subparagraph (F)—

1 (I) by striking “large scale” and
2 inserting “large-scale”; and

3 (II) by inserting “, quantum sen-
4 sors,” after “quantum repeaters”;

5 (iv) in subparagraph (G)—

6 (I) by inserting “data centers,
7 quantum sensors” after “repeaters,”;
8 and

9 (II) by striking “and” after the
10 semicolon;

11 (v) in subparagraph (H)—

12 (I) by striking “the quantum
13 technology stack” and inserting
14 “quantum technology modality
15 stacks”; and

16 (II) by striking “National Lab-
17 oratories in” and inserting “National
18 Laboratories such as”; and

19 (vi) by adding at the end the following
20 new subparagraphs:

21 “(I) development of quantum network and
22 entanglement distribution protocols or applica-
23 tions, including development of network stack
24 protocols and protocols enabling integration
25 with existing technologies or infrastructure; and

1 “(J) development of high efficiency room-
2 temperature photon detectors for quantum
3 phonic applications, including quantum net-
4 working and communications;”;

5 (C) in paragraph (4)—

6 (i) by striking “basic”; and

7 (ii) by striking “material” and insert-
8 ing “materials”; and

9 (D) in paragraph (5), by striking “funda-
10 mental”;

11 (3) in subsection (c)—

12 (A) in paragraph (6), by inserting “, in-
13 cluding small and medium-sized businesses and
14 startups” before the semicolon;

15 (B) in paragraph (7), by striking “and” at
16 the end;

17 (C) by redesignating paragraph (8) as (9);
18 and

19 (D) by inserting after paragraph (7) the
20 following new paragraph:

21 “(8) nonprofit organizations; and”; and

22 (4) in subsection (d), by striking “basic re-
23 search” and inserting “research, development, and
24 demonstration”.

1 **SEC. 5020. DEPARTMENT OF ENERGY QUANTUM USER EX-**
2 **PANSION FOR SCIENCE AND TECHNOLOGY**
3 **PROGRAM.**

4 Section 404 of the National Quantum Initiative Act
5 (15 U.S.C. 8854) is amended—

6 (1) in subsection (a)—

7 (A) in the matter preceding paragraph (1),
8 by striking “and quantum computing clouds”
9 and inserting “, software, and cloud-based
10 quantum computers”;

11 (B) in paragraph (3), by striking “and”
12 after the semicolon;

13 (C) in paragraph (4), by striking the pe-
14 riod and inserting a semicolon; and

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

17 “(5) to enable development of interoperable, se-
18 cure, and scalable software for cloud-based, hybrid,
19 and other appropriate environments, and applica-
20 tions, including estimation of resources needed to
21 scale applications; and

22 “(6) to develop near-term quantum applications
23 to solve public and private sector problems.”;

24 (2) in subsection (b)—

25 (A) in paragraph (4), by striking “and”
26 after the semicolon;

1 (B) in paragraph (5), by striking the pe-
2 riod and inserting a semicolon; and

3 (C) by at the end the following new para-
4 graphs:

5 “(6) enable users to develop algorithms, soft-
6 ware tools, simulators, and applications for quantum
7 systems using cloud-based quantum computers; and

8 “(7) partner with appropriate public and pri-
9 vate sector entities to develop training and education
10 opportunities on prototype and early-state devices.”;

11 (3) in subsection (c)—

12 (A) by redesignating paragraphs (4), (5),
13 (6), (7), and (8) as paragraphs (5), (6), (7),
14 (8), and (10), respectively;

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

17 “(4) the National Oceanic and Atmospheric Ad-
18 ministration;”;

19 (C) in paragraph (7), as so redesignated,
20 by inserting “, including small- and medium-
21 sized businesses and startups” before the semi-
22 colon;

23 (D) in paragraph (8), as so redesignated,
24 by striking “and” after the semicolon; and

1 (E) by inserting after paragraph (8), as so
2 redesignated the following new paragraph:

3 “(9) nonprofit organizations; and”; and

4 (4) in subsection (d)—

5 (A) in the heading, by striking “SECURITY”
6 and inserting “INTERAGENCY
7 FUNCTIONS”; and

8 (B) by striking “ensure” sand inserting
9 “carry out the following:

10 “(1) Align such activities, including with re-
11 spect to the benchmarking of software referred to in
12 paragraph (5) of subsection (a), such that such ac-
13 tivities are not duplicated across the Department of
14 Energy, the Foundation, and the Institute.

15 “(2) Ensure”.

16 **SEC. 5021. QUANTUM INFORMATION SCIENCE TO ENHANCE**
17 **THE RESILIENCE, SECURITY, AND EFFI-**
18 **CIENCY OF THE ELECTRIC GRID.**

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

1 **“SEC. 405. QUANTUM INFORMATION SCIENCE TO ENHANCE**
2 **THE RESILIENCE AND SECURITY OF THE**
3 **ELECTRIC GRID.**

4 “(a) IN GENERAL.—The Secretary of Energy (re-
5 ferred to in this section as the ‘Secretary’) shall conduct
6 research, development, and demonstration activities fo-
7 cused on the use of quantum information science, engi-
8 neering, and technology, including through quantum appli-
9 cations and quantum computing, to enhance the resilience,
10 security, and efficiency of the electric grid in the United
11 States.

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

15 “(1) Fault detection and prediction.

16 “(2) Grid security and safety, including through
17 post-quantum cryptography.

18 “(3) Integrated grid planning.

19 “(4) Grid optimization.

20 “(5) Enhanced modeling.

21 “(6) Energy storage.

22 “(7) Energy market optimization.

23 “(8) Any other area in which, in the determina-
24 tion of the Secretary, quantum information science,
25 engineering, and technology can enhance the resil-

1 ience, security, and efficiency of the electric grid in
2 the United States.

3 “(c) COOPERATION.—To the extent practicable, the
4 Secretary shall conduct research, development, and dem-
5 onstration activities under subsection (a) in cooperation,
6 including through partnerships, as the Secretary deter-
7 mines appropriate, with members of relevant industries,
8 National Laboratories, institutions of higher education,
9 nonprofit organizations, and other relevant institutions,
10 including research institutions, as determined by the Sec-
11 retary.”.

12 **SEC. 5022. RESEARCH SECURITY.**

13 Title IV of the National Quantum Initiative Act (15
14 U.S.C. 8851 et seq.), as amended by section 5021, is fur-
15 ther amended by adding at the end the following new sec-
16 tion:

17 **“SEC. 406. RESEARCH SECURITY.**

18 “The activities authorized under this title shall be ap-
19 plied in a manner consistent with subtitle D of title VI
20 of the Research and Development, Competition, and Inno-
21 vation Act (enacted as division B of Public Law 117–167;
22 42 U.S.C. 19231 et seq.).”.

1 **SEC. 5023. PUBLIC-PRIVATE PARTNERSHIP FOR QUANTUM**
2 **APPLICATION DEVELOPMENT ACCELERA-**
3 **TION.**

4 Title IV of the National Quantum Initiative Act (15
5 U.S.C. 8851 et seq.), as amended by sections 5021 and
6 5022, is further amended by adding at the end the fol-
7 lowing new section:

8 **“SEC. 407. PUBLIC-PRIVATE PARTNERSHIP FOR QUANTUM**
9 **APPLICATION DEVELOPMENT ACCELERA-**
10 **TION.**

11 “(a) ESTABLISHMENT OF COLLABORATIVE VENTURE
12 FOR QUANTUM APPLICATION DEVELOPMENT ACCELERA-
13 TION.—The Secretary of Commerce, in coordination with
14 the Director of the National Institute of Standards and
15 Technology, may establish or expand an existing collabo-
16 rative venture or consortia with other public sector entities
17 or private sector entities for the purpose of identifying and
18 developing near-term use cases of quantum technologies.

19 “(b) ENGAGEMENT.—In carrying out subsection (a),
20 the Secretary may, acting through the Director of the Na-
21 tional Institute of Standards and Technology—

22 “(1) coordinate activities with the Federal
23 agencies that are members of the Subcommittee on
24 Quantum Information Science or the Subcommittee
25 on the Economic and Security Implications of Quan-
26 tum Science; and

1 “(2) engage with—

2 “(A) the Quantum Economic Development
3 Consortium;

4 “(B) the National Laboratories (as such
5 term is defined in section 2 of the Energy Pol-
6 icy Act of 2005 (42 U.S.C. 15801));

7 “(C) federally funded research and devel-
8 opment centers; and

9 “(D) other members of the United States
10 quantum computing and quantum information
11 ecosystem.

12 “(c) DEFINITION.—In this section, the term ‘near-
13 term use case’ means—

14 “(1) in the case of an application that includes
15 the development of quantum computing hardware,
16 an application that can be developed and deployed in
17 less than three years; or

18 “(2) in the case of an application that includes
19 quantum technologies, including quantum commu-
20 nication, sensing, algorithm development for hybrid
21 applications, supply chain innovation, or demonstra-
22 tions of computational advantage, where new quan-
23 tum computer hardware would not need to be devel-
24 oped and deployed in less than 18 months.”.

1 **SEC. 5024. NATIONAL AERONAUTICS AND SPACE ADMINIS-**
2 **TRATION QUANTUM ACTIVITIES.**

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

5 **“TITLE V—NATIONAL AERO-**
6 **NAUTICS AND SPACE ADMIN-**
7 **ISTRATION QUANTUM ACTIVI-**
8 **TIES**

9 **“SEC. 501. QUANTUM INFORMATION SCIENCE, ENGINEER-**
10 **ING, AND TECHNOLOGY RESEARCH FOR**
11 **SPACE AND AERONAUTICS.**

12 “(a) IN GENERAL.—The Administrator of the Na-
13 tional Aeronautics and Space Administration is authorized
14 to carry out the following:

15 “(1) Carry out research on quantum informa-
16 tion science, engineering, and technology.

17 “(2) Designate an individual responsible for co-
18 ordinating quantum activities across the agency.

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

22 “(1) shall consider cooperative arrangements
23 with the Department of Energy and other Federal
24 departments and agencies, as practicable, on areas
25 of shared benefit; and

1 “(2) may enter into memoranda of under-
2 standing or memoranda of agreement to establish
3 such cooperative arrangements.

4 “(c) STRATEGY.—Not later than 180 days after the
5 date of the enactment of this title, the Administrator of
6 the National Aeronautics and Space Administration shall
7 submit to the appropriate committees of Congress a strat-
8 egy for National Aeronautics and Space Administration
9 research on quantum information science, engineering,
10 and technology. The strategy shall—

11 “(1) identify priority areas of quantum science,
12 engineering, and technologies, such as quantum
13 sensing, that have the highest potential to transform
14 and improve NASA’s missions, research, and devel-
15 opment activities;

16 “(2) identify opportunities for novel ways to in-
17 vestigate, explore, and advance measurements of the
18 Earth, the solar system, and the universe;

19 “(3) identify resources required to support im-
20 plementation of the strategy, including budgets,
21 workforce, and infrastructure; and

22 “(4) describe cooperative efforts with other
23 Federal departments and agencies, and address
24 areas of research and applications, including—

25 “(A) quantum sensing;

1 “(B) quantum networking;

2 “(C) quantum communications, including
3 quantum satellite communications;

4 “(D) quantum computing; and

5 “(E) science, aeronautics, and exploration-
6 related applications.

7 “(d) CONSULTATION.—In developing the strategy de-
8 scribed in subsection (c), the Administrator may seek
9 input from relevant external stakeholders, including insti-
10 tutions of higher education, industry, and nonprofit re-
11 search organizations.

12 **“SEC. 502. NATIONAL AERONAUTICS AND SPACE ADMINIS-**
13 **TRATION QUANTUM INSTITUTE.**

14 “(a) IN GENERAL.—Subject to the availability of ap-
15 propriations, the Administrator of the National Aero-
16 nautics and Space Administration, in consultation with
17 the heads of other Federal departments and agencies, as
18 appropriate, may carry out a program to establish an in-
19 stitute focused on space and aeronautics applications of
20 quantum information science, engineering, and tech-
21 nology.

22 “(b) INSTITUTE DETAILS.—

23 “(1) COMPETITIVE, MERIT-REVIEWED PROC-
24 ESS.—If the institute under this section is estab-

1 lished, the institute shall be so established through
2 a competitive, merit-reviewed process.

3 “(2) APPLICATIONS.—An eligible applicant
4 under this section shall submit to the Administrator
5 of the National Aeronautics and Space Administra-
6 tion an application at such time, in such manner,
7 and containing such information as the Adminis-
8 trator determines to be appropriate.

9 “(3) ELIGIBLE APPLICANTS.—When admin-
10 istering the process described in paragraph (1), the
11 Administrator of the National Aeronautics and
12 Space Administration shall consider applications
13 from institutions of higher education, research cen-
14 ters, multi-institutional collaborations, and any other
15 entity that the Administrator determines appro-
16 priate.

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

21 “(5) COORDINATION.—The Administrator of
22 the National Aeronautics and Space Administration
23 shall ensure an awardee under this section coordi-
24 nates the activities carried out under this section
25 with the National Aeronautics and Space Adminis-

1 tration, and avoids unnecessary duplication of exist-
2 ing activities of the Administration, other activities
3 carried out under this Act, and other related pro-
4 grams, as appropriate.

5 “(6) COMMERCIAL TECHNOLOGY.—The insti-
6 tute under this section may leverage commercially-
7 available hardware and software to carry out the ac-
8 tivities described in subsection (c).

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

11 “(1) support research focused on developing
12 space and aeronautics applications for quantum in-
13 formation science, engineering, and technology, in-
14 cluding as related to the results of the strategy
15 under section 501(c); and

16 “(2) support quantum information science, en-
17 gineering, and technology education and public out-
18 reach.

19 “(d) INSTITUTE REQUIREMENTS.—To the maximum
20 extent practicable, the institute under this section shall
21 serve the needs of the National Aeronautics and Space Ad-
22 ministration for the benefit of the broader United States
23 quantum information science community, to establish
24 processes for the purpose of advancing space and aero-
25 nautics applications in quantum information science, engi-

1 neering, and technology, and improving the competitive-
2 ness of the United States.

3 “(e) INSTITUTE SELECTION AND DURATION.—

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

7 “(2) REAPPLICATION.—Subject to the avail-
8 ability of appropriations, an awardee may reapply
9 for an additional, subsequent period of 5 years fol-
10 lowing a successful, merit-based review.

11 “(3) TERMINATION.—Consistent with the au-
12 thorities of the National Aeronautics and Space Ad-
13 ministration, the Administrator of the National Aer-
14 onautics and Space Administration may terminate
15 the institute for cause during the performance pe-
16 riod.

17 **“SEC. 503. RESEARCH SECURITY.**

18 “The activities authorized under title V shall be ap-
19 plied in a manner consistent with subtitle D of title VI
20 of the Research and Development, Competition, and Inno-
21 vation Act (enacted as division B of Public Law 117–167;
22 42 U.S.C. 19231 et seq.).”

1 **SEC. 5025. NATIONAL SCIENCE FOUNDATION CRYPTO-**
2 **RAPHY RESEARCH.**

3 Subsection (a)(1)(A) of section 4 of the Cyber Secu-
4 rity Research and Development Act (15 U.S.C. 7403) is
5 amended by inserting “, including post-quantum cryptog-
6 raphy (as such term is defined in section 3 of the Quan-
7 tum Computing Cybersecurity Preparedness Act (6 U.S.C.
8 1526 note; Public Law 117–260))” before the semicolon.

9 **SEC. 5026. REPORTS ON MITIGATING THE CYBERSECURITY**
10 **AND NATIONAL SECURITY RISKS POSED BY**
11 **CERTAIN QUANTUM COMPUTERS.**

12 (a) INITIAL REPORT.—Not later than one year after
13 the date of the enactment of this Act, the Subcommittee
14 on the Economic and Security Implications of Quantum
15 Information Science established under section 105 of the
16 National Quantum Initiative Act (15 U.S.C. 8814a) shall
17 carry out the following:

18 (1) Conduct an assessment of each of the fol-
19 lowing:

20 (A) The capabilities and progress of the
21 United States, relative to other countries, with
22 respect to the following:

23 (i) Developing a cryptographically-rel-
24 evant quantum computer.

25 (ii) Adopting security and prepared-
26 ness measures, including post-quantum

1 cryptography, to mitigate the cybersecurity
2 and national security risks posed by such
3 computer.

4 (B) The progress of private sector entities
5 and public sector entities in the United States
6 toward adopting such measures, including the
7 progress toward implementing the guidance
8 under section 4 of the Quantum Computing Cy-
9 bersecurity Preparedness Act (6 U.S.C. 1526).

10 (2) Identify the sectors of the economy most
11 vulnerable to such risks.

12 (3) Based upon such assessments and such
13 identification, develop a plan to mitigate such risks,
14 including by carrying out the following:

15 (A) Facilitating collaboration between
16 agencies and departments of the Federal Gov-
17 ernment.

18 (B) Facilitating the exchange of informa-
19 tion between such private sector entities and
20 public sector entities.

21 (C) Forming partnerships between the
22 Federal Government and such private sector en-
23 tities.

1 (D) Identifying such measures that such
2 private sector entities and public sector entities
3 may adopt.

4 (E) Supporting such exchange and the
5 adoption of such measures, including by identi-
6 fying actions, including piloting projects, pro-
7 viding technical assistance, and publishing
8 cyber hygiene guidance for such private sector
9 entities, that such agencies and departments
10 may carry out to support such exchange and
11 adoption.

12 (4) Develop guidelines for determining whether
13 a quantum computer is a cryptographically-relevant
14 quantum computer.

15 (5) Submit to the appropriate committees of
16 Congress a report in classified or unclassified form,
17 as appropriate, that includes information relating to
18 the following:

19 (A) The assessments conducted under
20 paragraph (1).

21 (B) The sectors identified under paragraph
22 (2).

23 (C) The plan developed under paragraph
24 (3).

1 (D) The guidelines developed under para-
2 graph (4).

3 (E) Recommendations for the following:

4 (i) A timetable to implement such
5 plan.

6 (ii) Policies to implement such plan
7 that require legislation.

8 (iii) Policies to implement such plan
9 that do not require legislation.

10 (b) SUBSEQUENT REPORTS.—Not later than one
11 year after the report under subsection (a) is submitted and
12 annually thereafter for four years, the Subcommittee re-
13 ferred to in such subsection shall submit to Congress a
14 report in classified or unclassified form, as appropriate,
15 that includes information relating to the progress of pri-
16 vate sector entities and public sector entities in the United
17 States toward adopting the measures described in such
18 subsection.

19 (c) DEFINITIONS.—In this section:

20 (1) APPROPRIATE COMMITTEES OF CON-
21 GRESS.—The term “appropriate committees of Con-
22 gress” has the meaning given such term in section
23 2 of the National Quantum Initiative Act (15 U.S.C.
24 8801).

1 (2) CLASSICAL COMPUTER; POST-QUANTUM
2 CRYPTOGRAPHY; QUANTUM COMPUTER.—The terms
3 “classical computer”, “post-quantum cryptography”,
4 and “quantum computer” have the meanings given
5 such terms in section 3 of the Quantum Computing
6 Cybersecurity Preparedness Act (6 U.S.C. 1526
7 note).

8 (3) CRYPTOGRAPHICALLY-RELEVANT QUANTUM
9 COMPUTER.—The term “cryptographically-relevant
10 quantum computer” means a quantum computer
11 with the ability to compromise a cryptographic sys-
12 tem that a classical computer is unable to com-
13 promise.

14 **SEC. 5027. STUDIES RELATING TO NATIONAL QUANTUM INI-**
15 **TIATIVE PROGRAM.**

16 (a) INDEPENDENT STUDY ON PROGRESS MADE BY
17 NATIONAL QUANTUM INITIATIVE PROGRAM.—

18 (1) AGREEMENT.—The Director of the Office of
19 Science and Technology Policy shall seek to enter
20 into an agreement with the National Academies of
21 Sciences, Engineering, and Medicine (in this sub-
22 section the “National Academies”) to carry out the
23 independent study under paragraph (2).

24 (2) INDEPENDENT STUDY.—Under an agree-
25 ment between the Director of the Office of Science

1 and Technology Policy and the National Academies
2 under this subsection, the National Academies shall
3 carry out an independent study to assess the
4 progress made by the National Quantum Initiative
5 Program in achieving the purposes set forth under
6 section 3 of the National Quantum Initiative Act (15
7 U.S.C. 8802) and the goals of the Program, includ-
8 ing with respect to sensing, communications, com-
9 puting, and workforce development for near-term de-
10 velopment and quantum applications.

11 (b) STUDY ON IMPEDIMENTS TO COLLABORATION
12 UNDER NATIONAL QUANTUM INITIATIVE PROGRAM.—

13 (1) STUDY AND REPORT.—Not later than 180
14 days after the date of the enactment of this Act, the
15 consortium convened by the Director of the National
16 Institute of Standards and Technology pursuant to
17 section 201(b)(1) of the National Quantum Initiative
18 Act (15 U.S.C. 8831(b)(1)) shall—

19 (A) conduct a study—

20 (i) on the impediments to collabora-
21 tion under the National Quantum Initia-
22 tive Program implemented pursuant to sec-
23 tion 101(a) of such Act (15 U.S.C.
24 8811(a)) between Multidisciplinary Centers
25 for Quantum Research and Education es-

1 established under section 302(a) of such Act
2 (15 U.S.C. 8842(a)), National Quantum
3 Information Science Research Centers es-
4 tablished and operated pursuant to section
5 402(a)(1) of such Act (15 U.S.C.
6 8852(a)(1)), industry, and academia; and

7 (ii) to develop recommendations for
8 legislative action to eliminate or mitigate
9 such impediments; and

10 (B) submit to the Committee on Com-
11 merce, Science, and Transportation of the Sen-
12 ate and the Committee on Science, Space, and
13 Technology of the House of Representatives a
14 report on the findings of the consortium with
15 respect to the study conducted pursuant to sub-
16 paragraph (A).

17 (2) CONTENTS.—The report submitted under
18 paragraph (1)(B) shall include the following:

19 (A) An overview of the current state of re-
20 search being conducted under the National
21 Quantum Initiative Program.

22 (B) A breakdown of the funding under the
23 Program for near-term quantum applications
24 development, disaggregated by different quan-
25 tum technologies, including computing (anneal-

1 ing and gate-model with the different types of
2 qubit technologies), sensing, communication,
3 and networking.

4 (C) Identification of potential risks in the
5 research funded under the Program.

6 **SEC. 5028. REAUTHORIZATION OF NEXT GENERATION**
7 **QUANTUM LEADERS PILOT PROGRAM OF THE**
8 **NATIONAL SCIENCE FOUNDATION.**

9 Paragraph (6) of section 10661(f) of the Research
10 and Development, Competition, and Innovation Act (Pub-
11 lic Law 117–167; relating to the Next Generation Quan-
12 tum Leaders Pilot Program of the National Science Foun-
13 dation for the education and training of the next genera-
14 tion of students and teachers in the fundamental prin-
15 ciples of quantum mechanics) is amended by striking
16 “four years” and inserting “eight years”.

17 **SEC. 5029. CLERICAL AMENDMENTS.**

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

20 (1) By striking the items relating to sections
21 105 and 106 and inserting the following new items:

 “Sec. 105. Subcommittee on the Economic and Security Implications of Quan-
 tum Information Science.

 “Sec. 105A. International Quantum Cooperation Strategy.

 “Sec. 106. Sunset.”.

22 (2) By inserting after the item relating to sec-
23 tion 201 the following new items:

“Sec. 202. National Institute of Standards and Technology quantum acceleration centers.

“Sec. 203. Research security.”;

1 (3) By inserting after the item relating to sec-
2 tion 302 the following new items:

“Sec. 303. Quantum Reskilling, Education, and Workforce (QREW) Coordination Hub.

“Sec. 304. Quantum testbeds.”.

3 (4) By inserting after the item relating to sec-
4 tion 401 the following new item:

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

5 (5) By inserting after the item relating to sec-
6 tion 404 the following new items:

“Sec. 405. Quantum information science to enhance the resilience and security of the electric grid.

“Sec. 406. Research security.

“Sec. 407. Public-private partnership for quantum application development acceleration.”.

7 (6) By adding at the end the following new
8 items:

“TITLE V—NATIONAL AERONAUTICS AND SPACE
ADMINISTRATION QUANTUM ACTIVITIES

“Sec. 501. Quantum information science, engineering, and technology research for space and aeronautics.

“Sec. 502. National Aeronautics and Space Administration quantum institute.

“Sec. 503. Research security.”.

