

## Union Calendar No.

115TH CONGRESS  
2D SESSION**H. R. 6227****[Report No. 115-]**

To provide for a coordinated Federal program to accelerate quantum research and development for the economic and national security of the United States.

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JUNE 26, 2018

Mr. SMITH of Texas, Ms. EDDIE BERNICE JOHNSON of Texas, Mrs. COMSTOCK, Mr. LIPINSKI, Mr. WEBER of Texas, Ms. LOFGREN, Mr. LUCAS, Ms. ESTY of Connecticut, Mr. ROHRABACHER, Ms. BONAMICI, Mr. HULTGREN, Mr. BEYER, Mr. KNIGHT, Ms. ROSEN, Mr. BABIN, Mr. MCNERNEY, Mr. BIGGS, Mr. TONKO, Mr. MARSHALL, Mr. FOSTER, Mr. DUNN, Mr. TAKANO, Mr. HIGGINS of Louisiana, Ms. HANABUSA, Mr. NORMAN, Mrs. LESKO, Mr. SCHWEIKERT, Mr. HURD, Mr. BROOKS of Alabama, Mr. POSEY, Mr. LOUDERMILK, and Mr. ABRAHAM) introduced the following bill; which was referred to the Committee on Science, Space, and Technology

JULY --, 2018

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

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

[For text of introduced bill, see copy of bill as introduced on June 26, 2018]

# **A BILL**

To provide for a coordinated Federal program to accelerate quantum research and development for the economic and national security of the United States.

1        *Be it enacted by the Senate and House of Representa-*  
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE; TABLE OF CONTENTS.**

4        (a) *SHORT TITLE.*—*This Act may be cited as the “Na-*  
5 *tional Quantum Initiative Act”.*

6        (b) *TABLE OF CONTENTS.*—

*Sec. 1. Short title; table of contents.*

*Sec. 2. Definitions.*

*Sec. 3. Purposes.*

*TITLE I—NATIONAL QUANTUM INITIATIVE*

*Sec. 101. National Quantum Initiative Program.*

*Sec. 102. National Quantum Coordination Office.*

*Sec. 103. Subcommittee on Quantum Information Science.*

*Sec. 104. National Quantum Initiative Advisory Committee.*

*Sec. 105. Sunset.*

*TITLE II—NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY  
QUANTUM ACTIVITIES*

*Sec. 201. National Institute of Standards and Technology activities and quantum  
workshop.*

*TITLE III—NATIONAL SCIENCE FOUNDATION AND MULTIDISCI-  
PLINARY CENTERS FOR QUANTUM RESEARCH AND EDUCATION*

*Sec. 301. Quantum information science research and education program.*

*Sec. 302. Multidisciplinary Centers for Quantum Research and Education.*

*TITLE IV—DEPARTMENT OF ENERGY RESEARCH AND NATIONAL  
QUANTUM INFORMATION SCIENCE RESEARCH CENTERS*

*Sec. 401. Quantum Information Science Research program.*

*Sec. 402. National Quantum Information Science Research Centers.*

*Sec. 403. Spending limitation.*

7 **SEC. 2. DEFINITIONS.**

8        *In this Act, the following definitions apply:*

9            (1) *ADVISORY COMMITTEE.*—*The term “Advisory*  
10 *Committee” means the National Quantum Initiative*  
11 *Advisory Committee established under section 104(a).*

1           (2) *COORDINATION OFFICE.*—*The term “Coordi-*  
2           *nation Office” means the National Quantum Coordi-*  
3           *nation Office established under section 102(a).*

4           (3) *INSTITUTIONS OF HIGHER EDUCATION.*—*The*  
5           *term “institutions of higher education” has the mean-*  
6           *ing given the term in section 101(a) of the Higher*  
7           *Education Act of 1965 (20 U.S.C. 1001(a)).*

8           (4) *PROGRAM.*—*The term “Program” means the*  
9           *National Quantum Initiative Program implemented*  
10          *under section 101(a).*

11          (5) *QUANTUM INFORMATION SCIENCE.*—*The term*  
12          *“quantum information science” means the storage,*  
13          *transmission, manipulation, or measurement of infor-*  
14          *mation that is encoded in systems that can only be*  
15          *described by the laws of quantum physics.*

16          (6) *SUBCOMMITTEE.*—*The term “Subcommittee”*  
17          *means the Subcommittee on Quantum Information*  
18          *Science of the National Science and Technology Coun-*  
19          *cil established under section 103(a).*

20   **SEC. 3. PURPOSES.**

21          *The purposes of this Act are to ensure the continued*  
22          *leadership of the United States in quantum information*  
23          *science and its technology applications by—*

1           (1) *supporting research, development, demonstra-*  
2           *tion, and application of quantum information science*  
3           *and technology in order to—*

4                   (A) *expand the number of researchers, edu-*  
5                   *cators, and students with training in quantum*  
6                   *information science and technology to develop a*  
7                   *workforce pipeline;*

8                   (B) *promote the development and inclusion*  
9                   *of multidisciplinary curriculum and research op-*  
10                   *portunities for quantum information science at*  
11                   *the undergraduate, graduate, and postdoctoral*  
12                   *level;*

13                   (C) *address basic research knowledge gaps;*

14                   (D) *promote the further development of fa-*  
15                   *ilities and centers available for quantum infor-*  
16                   *mation science and technology research, testing*  
17                   *and education; and*

18                   (E) *stimulate research on and promote more*  
19                   *rapid development of quantum-based tech-*  
20                   *nologies;*

21           (2) *improving the interagency planning and co-*  
22           *ordination of Federal research and development of*  
23           *quantum information science and technology and*  
24           *maximizing the effectiveness of the Federal Govern-*

1        *ment's quantum information science and technology*  
2        *research and development programs;*

3            *(3) promoting collaboration among government,*  
4        *Federal laboratories, industry, and universities; and*

5            *(4) promoting the development of standards for*  
6        *quantum information science and technology security.*

7        ***TITLE I—NATIONAL QUANTUM***  
8            ***INITIATIVE***

9        ***SEC. 101. NATIONAL QUANTUM INITIATIVE PROGRAM.***

10        *The President shall implement a 10-year National*  
11        *Quantum Initiative Program. In carrying out the Pro-*  
12        *gram, the President shall, acting through appropriate Fed-*  
13        *eral agencies, councils, working groups, subcommittees, and*  
14        *the Coordination Office—*

15            *(1) establish the goals, priorities, and metrics for*  
16        *a 10-year plan to accelerate development of quantum*  
17        *information science and technology applications in*  
18        *the United States;*

19            *(2) invest in fundamental Federal quantum in-*  
20        *formation science and technology research, develop-*  
21        *ment, demonstration, and other activities to achieve*  
22        *the goals established in paragraph (1);*

23            *(3) invest in activities to develop a quantum in-*  
24        *formation science and technology workforce pipeline;*

1           (4) *provide for interagency coordination of Fed-*  
2 *eral quantum information science and technology re-*  
3 *search, development, demonstration, and other activi-*  
4 *ties undertaken pursuant to the Program;*

5           (5) *partner with industry and academia to le-*  
6 *verage knowledge and resources; and*

7           (6) *leverage existing Federal investments effi-*  
8 *ciently to advance Program goals and objectives.*

9 **SEC. 102. NATIONAL QUANTUM COORDINATION OFFICE.**

10       (a) *ESTABLISHMENT.*—*The President shall establish a*  
11 *National Quantum Coordination Office, which shall have—*

12           (1) *a Director appointed by the Director of the*  
13 *Office of Science and Technology Policy, in consulta-*  
14 *tion with the Secretary of Commerce, the Director of*  
15 *the National Science Foundation, and the Secretary*  
16 *of Energy; and*

17           (2) *staff that shall be comprised of employees de-*  
18 *tailed from the Federal agencies that are members of*  
19 *the Subcommittee.*

20       (b) *RESPONSIBILITIES.*—*The Coordination Office*  
21 *shall—*

22           (1) *provide technical and administrative support*  
23 *to—*

24                   (A) *the Subcommittee; and*

25                   (B) *the Advisory Committee;*

1           (2) *oversee interagency coordination of the Pro-*  
2 *gram, including encouraging and supporting joint*  
3 *agency solicitation and selection of applications for*  
4 *funding of projects under the Program;*

5           (3) *serve as the point of contact on Federal civil-*  
6 *ian quantum information science and technology ac-*  
7 *tivities for Government organizations, academia, in-*  
8 *dustry, professional societies, State governments, and*  
9 *others to exchange technical and programmatic infor-*  
10 *mation;*

11          (4) *ensure coordination between the Multidisci-*  
12 *plinary Centers for Quantum Research and Edu-*  
13 *cation established under section 302(a) and the Na-*  
14 *tional Quantum Information Science Research Cen-*  
15 *ters established under section 402(a);*

16          (5) *conduct public outreach, including dissemi-*  
17 *nation of findings and recommendations of the Advi-*  
18 *sory Committee, as appropriate;*

19          (6) *promote access to and early application of*  
20 *the technologies, innovations, and expertise derived*  
21 *from Program activities to agency missions and sys-*  
22 *tems across the Federal Government, and to United*  
23 *States industry, including startup companies; and*

24          (7) *promote access, through appropriate Govern-*  
25 *ment agencies, to existing quantum computing and*

1        *communication systems developed by industry, aca-*  
2        *demia, and Federal laboratories to the general user*  
3        *community in pursuit of discovery of the new appli-*  
4        *cations of such systems.*

5        *(c) FUNDING.—Funds necessary to carry out the ac-*  
6        *tivities of the Coordination Office shall be made available*  
7        *each fiscal year by the participating agencies of the Sub-*  
8        *committee, as determined by the Director of the Office of*  
9        *Science and Technology Policy.*

10    **SEC. 103. SUBCOMMITTEE ON QUANTUM INFORMATION**  
11                                    **SCIENCE.**

12        *(a) ESTABLISHMENT.—The President shall establish,*  
13        *through the National Science and Technology Council, a*  
14        *Subcommittee on Quantum Information Science.*

15        *(b) MEMBERSHIP.—The Subcommittee shall include—*

16                    *(1) the National Institute of Standards and*  
17                    *Technology;*

18                    *(2) the National Science Foundation;*

19                    *(3) the Department of Energy;*

20                    *(4) the National Aeronautics and Space Admin-*  
21                    *istration;*

22                    *(5) the Department of Defense;*

23                    *(6) the Office of the Director of National Intel-*  
24                    *ligence;*

25                    *(7) the Office of Management and Budget;*

1           (8) *the Office of Science and Technology Policy;*  
2           *and*

3           (9) *any other Federal agency as considered ap-*  
4           *propriate by the President.*

5           (c) *CHAIRS.—The Subcommittee shall be jointly*  
6           *chaired by the Director of the National Institute of Stand-*  
7           *ards and Technology, the Director of the National Science*  
8           *Foundation, and the Secretary of Energy.*

9           (d) *RESPONSIBILITIES.—The Subcommittee shall—*

10           (1) *coordinate the quantum information science*  
11           *and technology research and education activities and*  
12           *programs of the Federal agencies;*

13           (2) *establish goals and priorities of the Program,*  
14           *based on identified knowledge and workforce gaps and*  
15           *other national needs;*

16           (3) *assess and recommend Federal infrastructure*  
17           *needs to support the Program; and*

18           (4) *evaluate opportunities for international co-*  
19           *operation with strategic allies on research and devel-*  
20           *opment in quantum information science and tech-*  
21           *nology.*

22           (e) *STRATEGIC PLAN.—Not later than 1 year after the*  
23           *date of enactment of this Act, the Subcommittee shall de-*  
24           *velop a 5-year strategic plan, and 6 years after enactment*  
25           *of the Act develop an additional 5-year strategic plan, with*

1 *periodic updates as appropriate to guide the activities of*  
2 *the Program, meet the goals, priorities, and anticipated*  
3 *outcomes of the participating agencies.*

4       (f) *REPORTS.*—*The Chairs of the Subcommittee shall*  
5 *submit to the President, the Advisory Committee, the Com-*  
6 *mittee on Science, Space, and Technology of the House of*  
7 *Representatives, the Committee on Commerce, Science, and*  
8 *Transportation and the Committee on Energy and Natural*  
9 *Resources of the Senate, and other appropriate committees*  
10 *of Congress the strategic plans developed under subsection*  
11 *(e) and any updates to such plans.*

12 **SEC. 104. NATIONAL QUANTUM INITIATIVE ADVISORY COM-**  
13 **MITTEE.**

14       (a) *IN GENERAL.*—*The President shall establish a Na-*  
15 *tional Quantum Initiative Advisory Committee.*

16       (b) *QUALIFICATIONS.*—*The Advisory Committee estab-*  
17 *lished by the President under subsection (a) shall consist*  
18 *of members from industry, academic institutions, and Fed-*  
19 *eral laboratories. The President shall appoint members to*  
20 *the Advisory Committee who are qualified to provide advice*  
21 *and information on quantum information science and tech-*  
22 *nology research, development, demonstrations, education,*  
23 *technology transfer, commercial application, or national se-*  
24 *curity and economic concerns.*

1           (c) *MEMBERSHIP CONSIDERATION.*—*In selecting an*  
2 *Advisory Committee, the President may seek and give con-*  
3 *sideration to recommendations from the Congress, industry,*  
4 *the scientific community (including the National Academy*  
5 *of Sciences, scientific professional societies, and academia),*  
6 *the defense community, and other appropriate organiza-*  
7 *tions.*

8           (d) *DUTIES.*—*The Advisory Committee shall advise the*  
9 *President and the Subcommittee and make recommenda-*  
10 *tions that shall be considered in reviewing and revising the*  
11 *Program. The Advisory Committee shall provide the Presi-*  
12 *dent and the Subcommittee with an independent assessment*  
13 *of—*

14                 (1) *trends and developments in quantum infor-*  
15 *mation science and technology;*

16                 (2) *progress made in implementing the Program;*

17                 (3) *whether the Program activities, priorities,*  
18 *and technical goals developed by the Subcommittee*  
19 *are helping to maintain United States leadership in*  
20 *quantum information science and technology;*

21                 (4) *the management, coordination, implementa-*  
22 *tion, and activities of the Program;*

23                 (5) *the need to revise the Program;*

24                 (6) *whether or not there are opportunities for*  
25 *international cooperation with strategic allies on re-*

1       *search and development in quantum information*  
2       *science and technology; and*

3             (7) *whether national security, societal, economic,*  
4       *legal, and workforce concerns are adequately ad-*  
5       *dressed by the Program.*

6       (e) *REPORTS.*—*The Advisory Committee shall report,*  
7       *not less frequently than once every 2 years, to the President*  
8       *on the assessments required under subsection (d) and any*  
9       *recommendations to improve the Program. The first report*  
10       *under this subsection shall be submitted not later than 6*  
11       *months after the date of enactment of this Act. The Director*  
12       *of the Office of Science and Technology Policy shall trans-*  
13       *mit a copy of each report under this subsection to the Com-*  
14       *mittee on Science, Space, and Technology of the House of*  
15       *Representatives, the Committee on Commerce, Science, and*  
16       *Technology of the Senate, the Committee on Energy and*  
17       *Natural Resources of the Senate, and other appropriate*  
18       *committees of the Congress.*

19       (f) *TRAVEL EXPENSES OF NON-FEDERAL MEMBERS.*—  
20       *Non-Federal members of the Advisory Committee, while at-*  
21       *tending meetings of the Advisory Committee or while other-*  
22       *wise serving at the request of the head of the Advisory Com-*  
23       *mittee away from their homes or regular places of business,*  
24       *may be allowed travel expenses, including per diem in lieu*  
25       *of subsistence, as authorized by section 5703 of title 5,*

1 *United States Code, for individuals in the Government serv-*  
2 *ing without pay. Nothing in this subsection shall be con-*  
3 *strued to prohibit members of the Advisory Committee who*  
4 *are officers or employees of the United States from being*  
5 *allowed travel expenses, including per diem in lieu of sub-*  
6 *sistence, in accordance with existing law.*

7       (g) *EXEMPTION.—The Advisory Committee shall be ex-*  
8 *empt from section 14 of the Federal Advisory Committee*  
9 *Act (5 U.S.C. App.).*

10 **SEC. 105. SUNSET.**

11       (a) *IN GENERAL.—Except as provided for in sub-*  
12 *section (b), the authority to carry out sections 101, 102,*  
13 *103, and 104 shall terminate on the date that is 11 years*  
14 *after the date of enactment of this Act.*

15       (b) *EXTENSION.—The President may continue the ac-*  
16 *tivities under such sections if the President determines that*  
17 *such activities are necessary to meet national economic or*  
18 *national security needs.*

1 **TITLE II—NATIONAL INSTITUTE**  
2 **OF STANDARDS AND TECH-**  
3 **NOLOGY QUANTUM ACTIVI-**  
4 **TIES**

5 **SEC. 201. NATIONAL INSTITUTE OF STANDARDS AND TECH-**  
6 **NOLOGY ACTIVITIES AND QUANTUM WORK-**  
7 **SHOP.**

8 (a) NATIONAL INSTITUTE OF STANDARDS AND TECH-  
9 NOLOGY ACTIVITIES.—As part of the Program described in  
10 title I, the Director of the National Institute of Standards  
11 and Technology shall—

12 (1) continue to support and expand basic quan-  
13 tum information science and technology research and  
14 development of measurement and standards infra-  
15 structure necessary to advance commercial develop-  
16 ment of quantum applications;

17 (2) use its existing programs, in collaboration  
18 with other agencies, as appropriate, to train scientists  
19 in quantum information science and technology to in-  
20 crease participation in the quantum fields;

21 (3) establish or expand collaborative ventures or  
22 consortia with other public or private sector entities,  
23 including academia, National Laboratories, and in-  
24 dustry for the purpose of advancing the field of quan-  
25 tum information science and engineering; and

1           (4) *have the authority to enter into and perform*  
2 *such contracts, including cooperative research and de-*  
3 *velopment arrangements and grants and cooperative*  
4 *agreements or other transactions, as may be necessary*  
5 *in the conduct of the work of the Institute and on*  
6 *such terms as the Director considers appropriate, in*  
7 *furtherance of the purposes of this Act.*

8           (b) *QUANTUM WORKSHOP.—*

9           (1) *IN GENERAL.—Not later than 1 year after*  
10 *the date of enactment of this Act, the Director of the*  
11 *National Institute of Standards and Technology shall*  
12 *convene a workshop of stakeholders to discuss the fu-*  
13 *ture measurement, standards, cybersecurity, and other*  
14 *appropriate needs for supporting the development of*  
15 *a robust quantum information science and technology*  
16 *industry in the United States. The goals of the work-*  
17 *shop shall be to—*

18                   (A) *assess the current research on the issues*  
19 *described in this paragraph;*

20                   (B) *evaluate the research gaps relating to*  
21 *such issues; and*

22                   (C) *provide recommendations on how the*  
23 *National Institute of Standards and Technology*  
24 *and the Program can address the research needs*  
25 *identified.*

1           (2) *REPORT TO CONGRESS.*—*Not later than 2*  
2           *years after the date of enactment of this Act, the Di-*  
3           *rector of the National Institute of Standards and*  
4           *Technology shall transmit to the Committee on*  
5           *Science, Space, and Technology of the House of Rep-*  
6           *resentatives and the Committee on Commerce,*  
7           *Science, and Transportation of the Senate a sum-*  
8           *mary report containing the findings of the workshop*  
9           *convened under this section.*

10          (c) *FUNDING.*—*The Secretary of Commerce shall devote*  
11          *\$400,000,000 to carry out this section, which shall include*  
12          *\$80,000,000 for each of fiscal years 2019 through 2023, sub-*  
13          *ject to the availability of appropriations, to come from*  
14          *amounts made available for the National Institute of*  
15          *Standards and Technology. This section shall be carried out*  
16          *using funds otherwise appropriated by law after the date*  
17          *of enactment of this Act.*

1 **TITLE III—NATIONAL SCIENCE**  
2 **FOUNDATION AND MULTI-**  
3 **DISCIPLINARY CENTERS FOR**  
4 **QUANTUM RESEARCH AND**  
5 **EDUCATION**

6 **SEC. 301. QUANTUM INFORMATION SCIENCE RESEARCH**  
7 **AND EDUCATION PROGRAM.**

8 (a) *IN GENERAL.*—*The Director of the National*  
9 *Science Foundation shall carry out a basic research and*  
10 *education program on quantum information science and*  
11 *engineering.*

12 (b) *PROGRAM COMPONENTS.*—*In carrying out the pro-*  
13 *gram required under subsection (a), the Director of the Na-*  
14 *tional Science Foundation shall carry out activities that*  
15 *continue to support basic interdisciplinary quantum infor-*  
16 *mation science and engineering research, and support*  
17 *human resources development in all aspects of quantum in-*  
18 *formation science and engineering. Such activities shall in-*  
19 *clude—*

20 (1) *using the existing programs of the National*  
21 *Science Foundation, in collaboration with other Fed-*  
22 *eral agencies, as appropriate, to—*

23 (A) *improve the teaching and learning of*  
24 *quantum information science and engineering at*

1           *the undergraduate, graduate, and postgraduate*  
2           *levels; and*

3                   *(B) increase participation in the quantum*  
4           *fields, including by individuals identified in sec-*  
5           *tions 33 and 34 of the Science and Engineering*  
6           *Equal Opportunities Act (42 U.S.C. 1885a; 42*  
7           *U.S.C. 1885b);*

8           *(2) formulating goals for quantum information*  
9           *science and engineering research and education ac-*  
10          *tivities to be supported by the National Science Foun-*  
11          *dation;*

12                   *(3) leveraging the collective body of knowledge*  
13          *from existing quantum information science and engi-*  
14          *neering research and education activities;*

15                   *(4) coordinating research efforts funded through*  
16          *existing programs across the directorates of the Na-*  
17          *tional Science Foundation; and*

18                   *(5) engaging with other Federal agencies, re-*  
19          *search communities, and potential users of informa-*  
20          *tion produced under this section.*

21   **SEC. 302. MULTIDISCIPLINARY CENTERS FOR QUANTUM RE-**  
22                   **SEARCH AND EDUCATION.**

23           *(a) MULTIDISCIPLINARY CENTERS FOR QUANTUM RE-*  
24          *SEARCH AND EDUCATION.—*

1           (1) *IN GENERAL.*—*The Director of the National*  
2           *Science Foundation, in consultation with other Fed-*  
3           *eral agencies as appropriate, shall award grants to*  
4           *institutions of higher education or eligible nonprofit*  
5           *organizations (or consortia thereof) to establish up to*  
6           *5 Multidisciplinary Centers for Quantum Research*  
7           *and Education.*

8           (2) *COLLABORATIONS.*—*A collaboration receiving*  
9           *an award under this subsection may include institu-*  
10          *tions of higher education, eligible nonprofit organiza-*  
11          *tions, and private sector entities.*

12          (3) *PURPOSE.*—*The purpose of the Centers shall*  
13          *be to conduct basic research and education activities*  
14          *in support of the goals and priorities of the Program*  
15          *as determined in title I, to—*

16                 (A) *continue to advance quantum informa-*  
17                 *tion science and engineering;*

18                 (B) *support curriculum and workforce de-*  
19                 *velopment in quantum information science and*  
20                 *engineering; and*

21                 (C) *foster innovation by bringing industry*  
22                 *perspectives to quantum research and workforce*  
23                 *development, including by leveraging industry*  
24                 *resources and research capacity.*

1           (4) *REQUIREMENTS.*—*An institution of higher*  
2           *education or an eligible nonprofit organization (or a*  
3           *consortium thereof) seeking funding under this section*  
4           *shall submit an application to the Director at such*  
5           *time, in such manner, and containing such informa-*  
6           *tion as the Director may require. The application*  
7           *shall include, at a minimum, a description of—*

8                   (A) *how the Center will work with other re-*  
9                   *search institutions and industry partners to le-*  
10                  *verage expertise in quantum science, education*  
11                  *and curriculum development, and technology*  
12                  *transfer;*

13                  (B) *how the Center will promote active col-*  
14                  *laboration among researchers in multiple dis-*  
15                  *ciplines involved in quantum research including*  
16                  *physics, engineering, mathematics, computer*  
17                  *science, chemistry, and material science;*

18                  (C) *how the Center will support long-term*  
19                  *and short-term workforce development in the*  
20                  *quantum field;*

21                  (D) *how the Center can support an innova-*  
22                  *tion ecosystem to work with industry to translate*  
23                  *Center research into applications; and*

1           (E) a long-term plan to become self-sus-  
2           taining after the expiration of Foundation sup-  
3           port.

4           (5) *SELECTION AND DURATION.*—

5           (A) *IN GENERAL.*—*The Centers selected and*  
6           *established under this section are authorized to*  
7           *carry out activities for a period of 5 years.*

8           (B) *REAPPLICATION.*—*An awardee may re-*  
9           *apply for an additional, subsequent period of 5*  
10          *years on a competitive, merit-reviewed basis.*

11          (C) *TERMINATION.*—*Consistent with the ex-*  
12          *isting authorities of the Foundation, the Director*  
13          *of the National Science Foundation may termi-*  
14          *nate an underperforming Center for cause dur-*  
15          *ing the performance period.*

16          (6) *FUNDING.*—*The Director of the National*  
17          *Science Foundation shall devote \$250,000,000 to*  
18          *carry out this section, which shall include*  
19          *\$50,000,000 for each of fiscal years 2019 through*  
20          *2023, subject to the availability of appropriations, to*  
21          *come from amounts made available for Research and*  
22          *Related Activities and Education and Human Re-*  
23          *sources. This section shall be carried out using funds*  
24          *otherwise appropriated by law after the date of enact-*  
25          *ment of this Act.*

1           (b) *GRADUATE TRAINEESHIPS.*—*The Director of the*  
2 *National Science Foundation may establish a program to*  
3 *provide traineeships to graduate students at institutions of*  
4 *higher education within the United States who are citizens*  
5 *of the United States and who choose to pursue masters or*  
6 *doctoral degrees in quantum information science.*

7 ***TITLE IV—DEPARTMENT OF EN-***  
8 ***ERGY RESEARCH AND NA-***  
9 ***TIONAL QUANTUM INFORMA-***  
10 ***TION SCIENCE RESEARCH***  
11 ***CENTERS***

12 ***SEC. 401. QUANTUM INFORMATION SCIENCE RESEARCH***  
13 ***PROGRAM.***

14           (a) *IN GENERAL.*—*The Secretary of Energy shall*  
15 *carry out a basic research program on quantum informa-*  
16 *tion science.*

17           (b) *PROGRAM COMPONENTS.*—*In carrying out the pro-*  
18 *gram required under subsection (a), the Secretary shall—*

19               (1) *formulate goals for quantum information*  
20 *science research to be supported by the Department of*  
21 *Energy;*

22               (2) *leverage the collective body of knowledge from*  
23 *existing quantum information science research;*

24               (3) *coordinate research efforts funded through ex-*  
25 *isting programs across the Office of Science; and*

1           (4) *engage with other Federal agencies, research*  
2           *communities, and potential users of information pro-*  
3           *duced under this section.*

4   **SEC. 402. NATIONAL QUANTUM INFORMATION SCIENCE RE-**  
5           **SEARCH CENTERS.**

6           (a) *IN GENERAL.*—*The Secretary of Energy shall en-*  
7           *sure that the Office of Science carries out a program, in*  
8           *consultation with other Federal agencies, as appropriate,*  
9           *to establish and operate up to 5 National Quantum Infor-*  
10           *mation Science Research Centers to conduct basic research*  
11           *to accelerate scientific breakthroughs in quantum informa-*  
12           *tion science and technology and to support research con-*  
13           *ducted under section 401. Such centers shall be established*  
14           *through a competitive, merit-reviewed process, and consider*  
15           *applications from National Laboratories, institutions of*  
16           *higher education, research centers, multi-institutional col-*  
17           *laborations, and other appropriate entities.*

18           (b) *COLLABORATIONS.*—*A collaboration receiving an*  
19           *award under this subsection may include multiple types of*  
20           *research institutions and private sector entities.*

21           (c) *REQUIREMENTS.*—*To the maximum extent prac-*  
22           *ticable, the Centers developed, constructed, operated, or*  
23           *maintained under this section shall serve the needs of the*  
24           *Department of Energy, industry, the academic community,*  
25           *and other relevant entities to create and develop processes*

1 *for the purpose of advancing basic research in quantum in-*  
2 *formation science and improving the competitiveness of the*  
3 *United States.*

4 (d) *COORDINATION.—The Secretary shall ensure the*  
5 *coordination of, and avoid unnecessary duplication of, the*  
6 *activities of each Center with the activities of—*

7 (1) *other research entities of the Department, in-*  
8 *cluding the Nanoscale Science Research Centers, the*  
9 *Energy Frontier Research Centers, and the Energy*  
10 *Innovation Hubs; and*

11 (2) *industry.*

12 (e) *SELECTION AND DURATION.—*

13 (1) *IN GENERAL.—The centers selected and estab-*  
14 *lished under this section are authorized to carry out*  
15 *activities for a period of 5 years.*

16 (2) *REAPPLICATION.—An awardee may reapply*  
17 *for an additional, subsequent period of 5 years on a*  
18 *competitive, merit-reviewed basis.*

19 (3) *TERMINATION.—Consistent with the existing*  
20 *authorities of the Department, the Secretary may ter-*  
21 *minate an underperforming Center for cause during*  
22 *the performance period.*

23 (f) *FUNDING.—The Secretary of Energy shall devote*  
24 *\$625,000,000 to carry out this section, which shall include*  
25 *\$125,000,000 for each of fiscal years 2019 through 2023,*

1 *subject to the availability of appropriations, to come from*  
2 *amounts made available for the Office of Science. This sec-*  
3 *tion shall be carried out using funds otherwise appropriated*  
4 *by law after the date of enactment of this Act.*

5 **SEC. 403. SPENDING LIMITATION.**

6 *No additional funds are authorized to be appropriated*  
7 *to carry out this Act and the amendments made by this*  
8 *Act, and this Act and such amendments shall be carried*  
9 *out using amounts otherwise available for such purpose.*