

119TH CONGRESS  
1ST SESSION

**S.** \_\_\_\_\_

To amend the National Quantum Initiative Act to provide for a research, development, and demonstration program, and for other purposes.

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IN THE SENATE OF THE UNITED STATES

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Mr. DURBIN (for himself, Mr. DAINES, Mr. SCHUMER, Ms. MURKOWSKI, Mr. YOUNG, and Mr. PADILLA) introduced the following bill; which was read twice and referred to the Committee on \_\_\_\_\_

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## A BILL

To amend the National Quantum Initiative Act to provide for a research, development, and demonstration program, and for other purposes.

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.**

4 This Act may be cited as the “Department of Energy  
5 Quantum Leadership Act of 2025”.

6 **SEC. 2. DEPARTMENT OF ENERGY QUANTUM INFORMATION**  
7 **SCIENCE RESEARCH PROGRAM.**

8 Section 401 of the National Quantum Initiative Act  
9 (15 U.S.C. 8851) is amended—

1           (1) by striking subsection (a) and inserting the  
2 following:

3           “(a) IN GENERAL.—The Secretary of Energy shall  
4 carry out a research, development, and demonstration pro-  
5 gram on quantum information science, engineering, and  
6 technology.”;

7           (2) in subsection (b)—

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

10           (B) in paragraph (2), by inserting “, engi-  
11 neering, and technology” after “science”;

12           (C) by striking paragraph (3) and insert-  
13 ing the following:

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

19           (D) by redesignating paragraphs (3)  
20 through (5) as paragraphs (5) through (7), re-  
21 spectively;

22           (E) by inserting after paragraph (2) the  
23 following:

24           “(3) operate National Quantum Information  
25 Science Research Centers under section 402 to ac-

1 celerate and scale scientific and technical break-  
2 throughs in quantum information science, engineer-  
3 ing, and technology, and maintain state-of-the-art  
4 infrastructure for quantum researchers and industry  
5 partners;

6 “(4) conduct cooperative basic and applied re-  
7 search with industry, National Laboratories, institu-  
8 tions of higher education, and other research institu-  
9 tions to facilitate the development, demonstration,  
10 and commercial application of quantum information  
11 science, engineering, and technology priorities, as de-  
12 termined by the Secretary of Energy, including in  
13 the fields of—

14 “(A) quantum information theory;

15 “(B) quantum physics;

16 “(C) quantum computational science, in-  
17 cluding hardware and software, machine learn-  
18 ing, and data science;

19 “(D) applied mathematics and algorithm  
20 development;

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

24 “(F) quantum sensing, imaging, and detec-  
25 tion;

1 “(G) materials science and engineering;

2 “(H) quantum modeling and simulation,  
3 including molecular modeling;

4 “(I) near- and long-term application devel-  
5 opment, as determined by the Secretary of En-  
6 ergy;

7 “(J) quantum chemistry;

8 “(K) quantum biology;

9 “(L) superconductive and high-perform-  
10 ance microelectronics; and

11 “(M) quantum security technologies;”;

12 (F) in paragraph (6) (as so redesignated),  
13 in subparagraph (F), by striking “and” at the  
14 end;

15 (G) in paragraph (7) (as so redesign-  
16 ated)—

17 (i) by striking “and” before “poten-  
18 tial”; and

19 (ii) by striking the period at the end  
20 and inserting “, and other relevant stake-  
21 holders, as determined by the Secretary of  
22 Energy; and”; and

23 (H) by adding at the end the following:

24 “(8) leverage the collective body of knowledge  
25 and data, including experience and resources from

1 existing Federal research activities and commercially  
2 available quantum computing hardware and soft-  
3 ware, to the extent practicable.”; and

4 (3) by adding at the end the following:

5 “(c) INDUSTRY OUTREACH.—In carrying out the pro-  
6 gram under subsection (a), the Secretary of Energy shall  
7 engage with the quantum technology industry and pro-  
8 mote commercialization of applications of quantum tech-  
9 nology relevant to the activities of the Department of En-  
10 ergy by—

11 “(1) educating—

12 “(A) the energy industry on near-term and  
13 commercially available quantum technologies;  
14 and

15 “(B) the quantum industry on potential  
16 energy applications;

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

21 “(3) advancing relevant domestic supply chains,  
22 manufacturing capabilities, and associated simula-  
23 tions or modeling capabilities;

24 “(4) facilitating commercialization of quantum  
25 technologies from National Laboratories and engag-

1 ing with the Quantum Economic Development Con-  
2 sortium and other organizations, as applicable, to  
3 transition component technologies that advance the  
4 development of a quantum supply chain; and

5 “(5) to the extent practicable, ensuring industry  
6 partner access, especially for small- and medium-  
7 sized businesses, to specialized quantum instrumen-  
8 tation, equipment, testbeds, and other infrastructure  
9 to design, prototype, and test novel quantum hard-  
10 ware and streamline user access to reduce costs and  
11 other administrative burdens.

12 “(d) HIGH-PERFORMANCE COMPUTING STRATEGIC  
13 PLAN.—

14 “(1) IN GENERAL.—Not later than 1 year after  
15 the date of enactment of this subsection, the Sec-  
16 retary of Energy shall submit to Congress a 10-year  
17 strategic plan to guide Federal programs in design-  
18 ing, expanding, and procuring hybrid, energy-effi-  
19 cient high-performance computing systems capable  
20 of integrating with a diverse set of accelerators, in-  
21 cluding quantum, artificial intelligence, and machine  
22 learning accelerators, to enable the computing facili-  
23 ties of the Department of Energy to advance na-  
24 tional computing resources.

1           “(2) CONTENTS.—The strategic plan under  
2 paragraph (1) shall include the following:

3           “(A) A conceptual plan to leverage capa-  
4 bilities and infrastructure from the exascale  
5 computing program, as the Secretary of Energy  
6 determines necessary.

7           “(B) A plan to minimize disruptions to the  
8 advanced scientific computing workforce.

9           “(C) A consideration of a diversity of  
10 quantum computing modalities.

11           “(D) A plan to integrate cloud access of  
12 commercially available quantum hardware and  
13 software to complement on-premises high-per-  
14 formance computing systems and resources con-  
15 sistent with the QUEST program established  
16 under section 404.

17           “(e) EARLY-STAGE QUANTUM HIGH-PERFORMANCE  
18 COMPUTING RESEARCH AND DEVELOPMENT PROGRAM.—

19           “(1) DEFINITION OF QUANTUM HIGH-PERFORM-  
20 ANCE COMPUTING.—In this subsection, the term  
21 ‘quantum high-performance computing’ means the  
22 use of classical high-performance computing systems  
23 with quantum processing units and hybrid quantum-  
24 classical algorithms to leverage the strength of com-  
25 putational architectures and solve complex problems.

1           “(2) PROGRAM.—The Secretary of Energy shall  
2           establish an early-stage research and development  
3           program in quantum high-performance computing—

4                   “(A) to inform the 10-year strategic plan  
5                   described in subsection (d)(1); and

6                   “(B) to build the necessary scientific com-  
7                   puting workforce to fulfill the objectives of that  
8                   plan.

9           “(3) ACTIVITIES.—The program established  
10           under paragraph (2) shall—

11                   “(A) support early-stage quantum super-  
12                   computing testbeds and prototypes; and

13                   “(B) connect early-stage quantum high-  
14                   performance computing projects to the Centers  
15                   funded under this Act.

16           “(4) FUNDING.—Of funds made available under  
17           subsection (i)(1), the Secretary of Energy shall use  
18           not more than \$20,000,000 for each of fiscal years  
19           2026 through 2030 to carry out the activities under  
20           this subsection.

21           “(f) SUPPLY CHAIN STUDY.—Not later than 1 year  
22           after the date of enactment of this subsection, the Sec-  
23           retary of Energy, in consultation with the Secretary of  
24           Commerce, shall conduct a study on quantum science, en-  
25           gineering, and technology supply chain needs, including—

1           “(1) identifying hurdles to growth in the quan-  
2           tum industry by leveraging the expertise of relevant  
3           stakeholders in academia and industry, including the  
4           Quantum Economic Development Consortium; and

5           “(2) making recommendations on how to  
6           strengthen the domestic supply of materials and  
7           technologies necessary for the development of a ro-  
8           bust manufacturing base and workforce.

9           “(g) TRAINEESHIP PROGRAM.—

10           “(1) IN GENERAL.—The Secretary of Energy  
11           shall establish a university-led traineeship pro-  
12           gram—

13           “(A) to address workforce development  
14           needs in quantum information science, engi-  
15           neering, and technology; and

16           “(B) that will focus on supporting in-  
17           creased participation, workforce development,  
18           and research experiences for underrepresented  
19           undergraduate and graduate students.

20           “(2) FUNDING.—Of funds made available under  
21           subsection (i)(1), the Secretary of Energy shall use  
22           not more than \$5,000,000 for each of fiscal years  
23           2026 through 2030 to carry out the activities under  
24           this subsection.

1       “(h) COORDINATION OF ACTIVITIES.—In carrying  
2 out this section, the Secretary of Energy shall, to the max-  
3 imum extent practicable, coordinate with the Director of  
4 the National Science Foundation, the Director of the Na-  
5 tional Institute of Standards and Technology, the Admin-  
6 istrator of the National Aeronautics and Space Adminis-  
7 tration, the Director of the Defense Advanced Research  
8 Projects Agency, and the heads of other relevant Federal  
9 departments and agencies to ensure that programs and  
10 activities carried out under this section complement and  
11 do not duplicate existing efforts across the Federal govern-  
12 ment.

13       “(i) FUNDING.—

14               “(1) IN GENERAL.—Of amounts authorized to  
15 be appropriated for the Department of Energy, the  
16 Secretary of Energy shall use not more than  
17 \$175,000,000 for each of fiscal years 2026 through  
18 2030 to carry out activities under this section.

19               “(2) RESTRICTIONS.—

20                       “(A) CONFUCIUS INSTITUTE.—None of the  
21 funds made available under this subsection may  
22 be obligated to or expended by an institution of  
23 higher education that maintains a contract or  
24 other agreement with a Confucius Institute or  
25 any successor of a Confucius Institute.

1                   “(B) FOREIGN COUNTRIES AND ENTITIES  
2                   OF CONCERN.—

3                   “(i) DEFINITIONS.—In this subpara-  
4                   graph:

5                   “(I) FOREIGN COUNTRY OF CON-  
6                   CERN.—The term ‘foreign country of  
7                   concern’ means—

8                   “(aa) a covered nation (as  
9                   defined in section 4872(d) of title  
10                  10, United States Code); and

11                  “(bb) any other country that  
12                  the Secretary of Energy, in con-  
13                  sultation with the Secretary of  
14                  Defense, the Secretary of State,  
15                  and the Director of National In-  
16                  telligence, determines to be en-  
17                  gaged in conduct that is detri-  
18                  mental to the national security or  
19                  foreign policy of the United  
20                  States.

21                  “(II) FOREIGN ENTITY OF CON-  
22                  CERN.—The term ‘foreign entity of  
23                  concern’ means a foreign entity  
24                  that—

1 “(aa) is designated as a for-  
2 eign terrorist organization by the  
3 Secretary of State under section  
4 219(a) of the Immigration and  
5 Nationality Act (8 U.S.C.  
6 1189(a));

7 “(bb) is included on the list  
8 of specially designated nationals  
9 and blocked persons maintained  
10 by the Office of Foreign Assets  
11 Control of the Department of the  
12 Treasury;

13 “(cc) is owned by, controlled  
14 by, or subject to the jurisdiction  
15 or direction of a government of a  
16 foreign country that is a covered  
17 nation (as defined in section  
18 4872(d) of title 10, United  
19 States Code);

20 “(dd) is alleged by the At-  
21 torney General to have been in-  
22 volved in activities for which a  
23 conviction was obtained under—

24 “(AA) chapter 37 of  
25 title 18, United States Code

1 (commonly known as the  
2 ‘Espionage Act’);

3 “(BB) section 951 or  
4 1030 of title 18, United  
5 States Code;

6 “(CC) chapter 90 of  
7 title 18, United States Code  
8 (commonly known as the  
9 ‘Economic Espionage Act of  
10 1996’);

11 “(DD) the Arms Ex-  
12 port Control Act (22 U.S.C.  
13 2751 et seq.);

14 “(EE) section 224,  
15 225, 226, 227, or 236 of the  
16 Atomic Energy Act of 1954  
17 (42 U.S.C. 2274, 2275,  
18 2276, 2277, 2284);

19 “(FF) the Export Con-  
20 trol Reform Act of 2018 (50  
21 U.S.C. 4801 et seq.); or

22 “(GG) the International  
23 Emergency Economic Pow-  
24 ers Act (50 U.S.C. 1701 et  
25 seq.); or

1                   “(ee) is determined by the  
2                   Secretary of Energy, in consulta-  
3                   tion with the Secretary of De-  
4                   fense and the Director of Na-  
5                   tional Intelligence, to be engaged  
6                   in unauthorized conduct that is  
7                   detrimental to the national secu-  
8                   rity or foreign policy of the  
9                   United States.

10                   “(ii) RESTRICTION.—None of the  
11                   funds made available under this subsection  
12                   may be obligated or expended to promote,  
13                   establish, or finance quantum research ac-  
14                   tivities between a United States entity and  
15                   a foreign country of concern or a foreign  
16                   entity of concern.”.

17 **SEC. 3. DOE QUANTUM INSTRUMENTATION AND FOUNDRY**  
18 **PROGRAM.**

19                   The National Quantum Initiative Act is amended by  
20 inserting after section 401 (15 U.S.C. 8851) the following:

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

23                   “(a) IN GENERAL.—The Secretary of Energy shall  
24 establish an instrumentation and infrastructure program  
25 to carry out the following:

1           “(1) Maintain United States leadership in  
2 quantum information science, engineering, and tech-  
3 nology.

4           “(2) Develop domestic quantum supply chains.

5           “(3) Provide resources for the broader scientific  
6 community.

7           “(4) Support activities carried out under sec-  
8 tions 401, 402, 403, and 404.

9           “(b) PROGRAM COMPONENTS.—In carrying out the  
10 program under subsection (a), the Secretary of Energy  
11 shall—

12           “(1) develop, design, build, purchase, and com-  
13 mercialize specialized equipment, laboratory infra-  
14 structure, and state-of-the-art instrumentation to  
15 advance quantum engineering research and the de-  
16 velopment of quantum component technologies at a  
17 scale sufficient to meet the needs of the scientific  
18 community and enable commercialization of quan-  
19 tum technology;

20           “(2) leverage the capabilities of National Lab-  
21 oratories and Nanoscale Science Research Centers,  
22 including facilities and experts that research and de-  
23 velop novel quantum materials and devices; and

24           “(3) consider the technologies and end-use ap-  
25 plications that have significant economic potential,

1 as determined by the Secretary, based on consulta-  
2 tion with relevant stakeholders in academia and in-  
3 dustry, including the Quantum Economic Develop-  
4 ment Consortium.

5 “(c) QUANTUM FOUNDRIES.—In carrying out the  
6 program under subsection (a), and in coordination with  
7 institutions of higher education and industry, the Sec-  
8 retary of Energy shall support the development of quan-  
9 tum foundries focused on meeting the device, hardware,  
10 software, and materials needs of the scientific community  
11 and the quantum supply chain.

12 “(d) CONSULTATION.—In carrying out the program  
13 under subsection (a), the Secretary of Energy shall consult  
14 with the following entities to identify the instrumentation,  
15 equipment, infrastructure, and materials needed to sup-  
16 port the objectives of that program:

17 “(1) The National Institute of Standards and  
18 Technology.

19 “(2) The National Science Foundation.

20 “(3) The National Aeronautics and Space Ad-  
21 ministration.

22 “(4) Any other relevant Federal agency.

23 “(5) The National Laboratories.

24 “(6) National Quantum Information Science  
25 Research Centers.

1 “(7) Industry stakeholders.

2 “(8) Institutions of higher education.

3 “(9) Any other research institution.

4 “(e) FUNDING.—Of amounts authorized to be appro-  
5 priated for the Department of Energy, the Secretary of  
6 Energy shall use not more than \$50,000,000 for each of  
7 fiscal years 2026 through 2030 to carry out this section.”.

8 **SEC. 4. NATIONAL QUANTUM INFORMATION SCIENCE RE-**  
9 **SEARCH CENTERS.**

10 Section 402 of the National Quantum Initiative Act  
11 (15 U.S.C. 8852) is amended—

12 (1) in subsection (a)—

13 (A) in paragraph (1)—

14 (i) by striking “basic”; and

15 (ii) by striking “science and tech-  
16 nology and to support research conducted  
17 under section 401” and inserting “science,  
18 engineering, and technology, expand capac-  
19 ity for the domestic quantum workforce,  
20 and support research conducted under sec-  
21 tions 401, 403, and 404”; and

22 (B) in paragraph (2)(C), by inserting  
23 “that may include 1 or more commercial enti-  
24 ties” after “collaborations”;

1 (2) in subsection (b), by inserting “and should  
2 be inclusive of the variety of viable quantum tech-  
3 nologies, as appropriate” before the period at the  
4 end;

5 (3) in subsection (c)—

6 (A) by striking “basic”; and

7 (B) by inserting “, engineering, and tech-  
8 nology, accelerating quantum workforce devel-  
9 opment,” after “science”;

10 (4) in subsection (e), by striking paragraph (2)  
11 and inserting the following:

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

16 (5) in subsection (f), in the first sentence—

17 (A) by striking “\$25,000,000” and insert-  
18 ing “\$35,000,000”; and

19 (B) by striking “2019 through 2023” and  
20 inserting “2026 through 2030”.

21 **SEC. 5. DEPARTMENT OF ENERGY QUANTUM NETWORK IN-**  
22 **FRASTRUCTURE RESEARCH AND DEVELOP-**  
23 **MENT PROGRAM.**

24 Section 403 of the National Quantum Initiative Act  
25 (15 U.S.C. 8853) is amended—

- 1 (1) in subsection (a)—
- 2 (A) in paragraph (4)—
- 3 (i) by inserting “, including” after
- 4 “networking”; and
- 5 (ii) by striking “and” at the end;
- 6 (B) in paragraph (5), by striking the pe-
- 7 riod at the end and inserting a semicolon; and
- 8 (C) by adding at the end the following:
- 9 “(6) as applicable, leverage a diversity of mo-
- 10 dalities and commercially available quantum hard-
- 11 ware and software; and
- 12 “(7) develop education and training pathways
- 13 related to quantum network infrastructure invest-
- 14 ments, aligned with existing programmatic invest-
- 15 ments by the Department of Energy.”; and
- 16 (2) in subsection (b)—
- 17 (A) in paragraph (1)—
- 18 (i) by redesignating subparagraphs
- 19 (C) and (D) as subparagraphs (D) and
- 20 (E), respectively; and
- 21 (ii) by inserting after subparagraph
- 22 (B) the following:
- 23 “(C) the Administrator of the National
- 24 Aeronautics and Space Administration and the

1 head of any other relevant Federal agency, as  
2 determined by the Secretary;”;

3 (B) in paragraph (2)—

4 (i) in subparagraph (A), by inserting  
5 “ground-to-space and” before “space-to-  
6 ground”;

7 (ii) in subparagraph (E), by striking  
8 “photon-based” and inserting “all applica-  
9 ble modalities of”;

10 (iii) in subparagraph (F), by inserting  
11 “, quantum sensors,” after “quantum re-  
12 peaters”;

13 (iv) in subparagraph (G)—

14 (I) by inserting “data centers,”  
15 after “repeaters,”; and

16 (II) by striking “and” at the end;

17 (v) in subparagraph (H)—

18 (I) by striking “the quantum  
19 technology stack” and inserting  
20 “quantum technology modality  
21 stacks”; and

22 (II) by striking “National Lab-  
23 oratories in” and inserting “National  
24 Laboratories such as”; and

1 (vi) by adding at the end the fol-  
2 lowing:

3 “(I) development of quantum network and  
4 entanglement distribution protocols or applica-  
5 tions, including development of network stack  
6 protocols and protocols enabling integration  
7 with existing technologies or infrastructure; and

8 “(J) development of high-efficiency room-  
9 temperature photon detectors for quantum  
10 photonic applications, including quantum net-  
11 working and communications;”;

12 (C) in paragraph (4)—

13 (i) by striking “basic”; and

14 (ii) by striking “material” and insert-  
15 ing “materials”; and

16 (D) in paragraph (5), by striking “funda-  
17 mental”; and

18 (3) in subsection (d), by striking “basic re-  
19 search” and inserting “research, development, and  
20 demonstration”.

21 **SEC. 6. DEPARTMENT OF ENERGY QUANTUM USER EXPAN-**  
22 **SION FOR SCIENCE AND TECHNOLOGY PRO-**  
23 **GRAM.**

24 Section 404 of the National Quantum Initiative Act  
25 (15 U.S.C. 8854) is amended—

## 22

1 (1) in subsection (a)—

2 (A) in the matter preceding paragraph (1),  
3 by striking “and quantum computing clouds”  
4 and inserting “, software, and cloud-based  
5 quantum computing”;

6 (B) in paragraph (3), by striking “and” at  
7 the end;

8 (C) in paragraph (4), by striking the pe-  
9 riod at the end and inserting a semicolon; and

10 (D) by adding at the end the following:

11 “(5) to enable development of software and ap-  
12 plications, including estimation of resources needed  
13 to scale applications; and

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

16 (2) in subsection (b)—

17 (A) in paragraph (4), by striking “and” at  
18 the end;

19 (B) in paragraph (5), by striking the pe-  
20 riod at the end and inserting a semicolon; and

21 (C) by adding at the end the following:

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

1           “(7) partner with appropriate public- and pri-  
2           vate-sector entities to develop training and education  
3           opportunities on prototype and early-stage devices to  
4           support commercial applications.”;

5           (3) in subsection (c)—

6           (A) by redesignating paragraphs (4)  
7           through (8) as paragraphs (5) through (9), re-  
8           spectively; and

9           (B) by inserting after paragraph (3) the  
10          following:

11          “(4) the National Oceanic and Atmospheric Ad-  
12          ministration;”; and

13          (4) in subsection (e)—

14          (A) in paragraph (4), by striking “and” at  
15          the end;

16          (B) in paragraph (5), by striking the pe-  
17          riod at the end and inserting a semicolon; and

18          (C) by adding at the end the following:

19          “(6) \$38,000,000 for fiscal year 2028;

20          “(7) \$39,900,000 for fiscal year 2029; and

21          “(8) \$41,895,000 for fiscal year 2030.”.