

117TH CONGRESS
1ST SESSION

H. R. 6291

To provide for a comprehensive and integrative program to accelerate microelectronics research and development at the Department of Energy, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

DECEMBER 14, 2021

Mr. TONKO (for himself and Mr. ELLZEY) introduced the following bill; which was referred to the Committee on Science, Space, and Technology

A BILL

To provide for a comprehensive and integrative program to accelerate microelectronics research and development at the Department of Energy, 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 “Microelectronics Re-
5 search for Energy Innovation Act” or the “Micro Act”.

6 **SEC. 2. DEFINITIONS.**

7 In this Act:

8 (1) DEPARTMENT.—The term “Department”
9 means the Department of Energy.

1 (2) HISTORICALLY BLACK COLLEGE AND UNI-
2 VERSITY.—The term “historically Black college and
3 university” has the meaning given the term “part B
4 institution” in section 322 of the Higher Education
5 Act of 1965 (20 U.S.C. 1061).

6 (3) INSTITUTION OF HIGHER EDUCATION.—The
7 term “institution of higher education” has the
8 meaning given the term in section 101(a) of the
9 Higher Education Act of 1965 (20 U.S.C. 1001(a)).

10 (4) MINORITY SERVING INSTITUTION.—The
11 term “minority serving institution” includes the en-
12 tities described in any of the paragraphs (1) through
13 (7) of section 371(a) of the Higher Education Act
14 of 1965 (20 U.S.C. 1067q(a)).

15 (5) NATIONAL LABORATORY.—The term “Na-
16 tional Laboratory” has the meaning given the term
17 in section 2 of the Energy Policy Act of 2005 (42
18 U.S.C. 15801).

19 (6) SECRETARY.—The term “Secretary” means
20 the Secretary of Energy.

21 (7) TRIBAL COLLEGE AND UNIVERSITY.—The
22 term “Tribal College and University” has the mean-
23 ing given in section 316 of the Higher Education
24 Act of 1965 (20 U.S.C. 1059c).

1 **SEC. 3. FINDINGS.**

2 Congress finds that—

3 (1) the coming end of Moore’s Law presents
4 major technological challenges and opportunities for
5 the United States and important implications for na-
6 tional security, economic competitiveness, and sci-
7 entific discovery;

8 (2) future progress and innovation in microelec-
9 tronics, and maintaining a robust domestic micro-
10 electronics supply chain, will require an approach
11 that advances relevant materials science, electronic
12 and photonic device technologies, processing and
13 packaging technologies, manufacturing technologies,
14 circuit, chip, and system architecture, and software
15 system and algorithm development in a co-design
16 fashion;

17 (3) the National Laboratories possess unique
18 technical expertise and user facilities that are essen-
19 tial to overcoming foundational research challenges
20 relevant to the topics described in paragraph (2),
21 and translating and transferring research outcomes
22 to industry; and

23 (4) the assets described in paragraph (3) will
24 enable the Department to drive advances in micro-
25 electronics that are essential to meeting future needs
26 in areas critical to its mission as well as the future

1 competitiveness of the domestic microelectronics in-
2 dustry, including high-performance computing,
3 emerging data-centric computing approaches, and
4 energy-efficient computing; optical sensors, sources,
5 and wireless networks; and power electronics and
6 electricity delivery systems.

7 **SEC. 4. MICROELECTRONICS RESEARCH PROGRAM.**

8 (a) IN GENERAL.—The Secretary shall carry out a
9 cross-cutting program of research, development, and dem-
10 onstration of microelectronics relevant to the mission of
11 the Department and in the service of the Nation’s global
12 competitiveness in the field of microelectronics.

13 (b) RESEARCH AREAS.—In carrying out the program
14 under subsection (a), the Secretary shall award financial
15 assistance to eligible entities under subsection (c) to carry
16 out research projects in—

17 (1) foundational science areas, including—

18 (A) materials sciences, chemical sciences,
19 and plasma science synthesis, and fabrication;

20 (B) novel microelectronics devices, includ-
21 ing emerging memory and storage technologies;

22 (C) diverse computing architectures and
23 paradigms, including analog computing and
24 edge computing;

25 (D) data-driven modeling and simulation;

1 (E) integrated sensing, power harvesting,
2 and communications;

3 (F) component integration and subsystems;

4 (G) photonic integration; and

5 (H) development of co-design frameworks
6 for all stages of microelectronics design, devel-
7 opment, fabrication, and application;

8 (2) methods for leveraging advanced simulation,
9 artificial intelligence, and machine learning to en-
10 hance co-design and discovery in microelectronics;

11 (3) in consultation with the National Institute
12 of Standards and Technology, fabrication and proc-
13 essing science and metrology associated with micro-
14 electronics manufacturing, including lithography,
15 patterning, surface deposition, etching, and cleaning;

16 (4) approaches for optimizing system-level ad-
17 vanced computing energy efficiency for the electrical
18 grid, power electronics, and other energy infrastruc-
19 ture;

20 (5) approaches for enhancing the durability and
21 lifetime of radiation-hardened electronics; and

22 (6) enhancement of microelectronics security,
23 including the development of integrated devices,
24 packages, and thermal management for severe envi-
25 ronments and national security.

1 (c) ELIGIBLE ENTITIES.—The entities eligible to re-
2 ceive financial assistance under this section include—

3 (1) an institution of higher education, including
4 historically Black colleges and universities, Tribal
5 colleges and universities, and minority serving insti-
6 tutions;

7 (2) a nonprofit research organization;

8 (3) a State research agency;

9 (4) a National Laboratory;

10 (5) a private commercial entity;

11 (6) a partnership or consortium of 2 or more
12 entities described in paragraphs (1) through (5); and

13 (7) any other entities the Secretary deems ap-
14 propriate.

15 (d) TECHNOLOGY TRANSFER.—In carrying out the
16 program described in subsection (a), the Secretary, in co-
17 ordination with the Director of the Office of Technology
18 Transitions shall support translational research and trans-
19 fer of microelectronics technologies for the benefit of
20 United States economic competitiveness.

21 (e) EDUCATION AND OUTREACH.—In carrying out
22 the program under subsection (a), the Secretary shall sup-
23 port education and outreach activities to disseminate in-
24 formation and promote public understanding of microelec-
25 tronics and the microelectronics workforce.

1 (f) REPORT.—Not less than 180 days after the enact-
2 ment of this Act, the Secretary shall submit to the Com-
3 mittee on Science, Space, and Technology of the House
4 of Representatives, and the Committee on Energy and
5 Natural Resources of the Senate, a report describing the
6 goals, priorities, and anticipated outcomes of the program
7 described in subsection (a).

8 (g) FUNDING.—There are authorized to be appro-
9 priated to the Secretary to carry out the activities de-
10 scribed in this section—

- 11 (1) \$75,000,000 for fiscal year 2022;
- 12 (2) \$100,000,000 for fiscal year 2023;
- 13 (3) \$100,000,000 for fiscal year 2024;
- 14 (4) \$100,000,000 for fiscal year 2025; and
- 15 (5) \$100,000,000 for fiscal year 2026.

16 **SEC. 5. MICROELECTRONICS SCIENCE RESEARCH CEN-**
17 **TERS.**

18 (a) IN GENERAL.—In carrying out the program
19 under section 4, the Secretary, acting through the Direc-
20 tor of the Office of Science, shall establish up to four
21 Microelectronics Science Research Centers (referred to in
22 this section as “Centers”) to conduct mission-driven re-
23 search to address foundational challenges in the design,
24 development, and fabrication of microelectronics and to fa-
25 cilitate the translation of research results to industry.

1 (b) ACTIVITIES.—The activities of the Centers au-
2 thorized under this section shall include research, develop-
3 ment, and demonstration activities for—

4 (1) accelerating the development of new micro-
5 electronics science and technology, including mate-
6 rials, devices, circuits, systems, architectures, fab-
7 rication tools, processes, diagnostics, modeling, syn-
8 thesis, and metrology;

9 (2) advancing the sustainability and energy effi-
10 ciency of new microelectronics devices, packages, and
11 systems;

12 (3) application-driven co-design and prototyping
13 of novel devices to facilitate laboratory-to-fabrication
14 transition;

15 (4) advancing knowledge and experimental ca-
16 pabilities in surface and materials science, plasma
17 science, and computational and theoretical methods,
18 including artificial intelligence, machine learning,
19 multi-scale co-design, and advanced supercomputing
20 capabilities to invent and manufacture revolutionary
21 microelectronic devices;

22 (5) creating technology testbeds for prototyping
23 platforms for validation and verification of new ca-
24 pabilities and sharing of ideas, intellectual property,
25 and the unique facilities of the Department; and

1 (6) supporting long-term and short-term work-
2 force development in microelectronics.

3 (c) REQUIREMENTS.—

4 (1) SELECTION AND DURATION.—The Director
5 of the Office of Science shall select Centers on a
6 competitive, merit-reviewed basis for a period of not
7 more than 5 years, subject to the availability of ap-
8 propriations, beginning on the date of establishment
9 of that Center.

10 (2) APPLICATIONS.—An eligible applicant under
11 this subsection shall submit to the Director of the
12 Office of Science an application at such time, in
13 such manner, and containing such information as
14 the Director deems appropriate.

15 (3) ELIGIBLE APPLICANTS.—The Director of
16 the Office of Science shall consider applications from
17 National Laboratories, institutions of higher edu-
18 cation, research centers, or a consortia thereof, or
19 any other entity that the Secretary of Energy deems
20 appropriate.

21 (4) RENEWAL.—After the end of either period
22 described in paragraph (1), the Director of the Of-
23 fice of Science may renew support for the Center for
24 a period of not more than 5 years on a merit-re-
25 viewed basis. For a Center in operation for 10 years

1 after its previous selection on a competitive, merit-
2 reviewed basis, the Director may renew support for
3 the center on a competitive, merit-reviewed basis for
4 a period of not more than 5 years, and may subse-
5 quently provide an additional renewal on a merit-re-
6 viewed basis for a period of not more than 5 years.

7 (5) TERMINATION.—Consistent with the exist-
8 ing authorities of the Department, the Director of
9 the Office of Science may terminate an underper-
10 forming center for cause during the performance pe-
11 riod.

12 (d) TECHNOLOGY TRANSFER.—The Director of the
13 Office of Science, in coordination with the Director of the
14 Office of Technology Transitions, shall implement part-
15 nerships with industry groups for the purpose of facili-
16 tating the translation and transfer of research results pro-
17 duced by the Centers.

18 (e) COORDINATION.—The Secretary shall—

19 (1) establish a coordinating network to coordi-
20 nate cross-cutting research and foster communica-
21 tion and collaboration among the Centers; and

22 (2) ensure the coordination, and avoid unneces-
23 sary duplication, of the activities of each Center with
24 the activities of—

1 (A) other research entities of the Depart-
2 ment, including—

3 (i) the Nanoscale Science Research
4 Centers;

5 (ii) the National Quantum Informa-
6 tion Science Research Centers;

7 (iii) the Energy Frontier Research
8 Centers;

9 (iv) the Energy Innovation Hubs; and

10 (v) the National Laboratories;

11 (B) the National Semiconductor Tech-
12 nology Center authorized in title XCIX of divi-
13 sion H of the William M. (Mac) Thornberry
14 National Defense Authorization Act for Fiscal
15 Year 2021 (Public Law 116–283);

16 (C) institutions of higher education;

17 (D) industry; and

18 (E) research activities carried out by other
19 Federal agencies.

20 (f) FUNDING.—The Secretary of Energy shall allo-
21 cate up to \$25,000,000 for each Center established under
22 this section for each of fiscal years 2022 through 2026,
23 subject to the availability of appropriations.

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