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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

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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.

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

SECTION 1. SHORT TITLE.

This Act may be cited as the ''Microelectronics Research for Energy Innovation Act'' or the ''Micro Act''.

SEC. 2. DEFINITIONS.

In this Act:

(1) DEPARTMENT.—The term ''Department'' means the Department of Energy.

(2) HISTORICALLY BLACK COLLEGE AND UNIVERSITY.—The term ''historically Black college and university'' has the meaning given the term ''part B institution'' in section 322 of the Higher Education Act of 1965 (20 U.S.C. 1061).

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

(4) MINORITY SERVING INSTITUTION.—The term ''minority serving institution'' includes the entities described in any of the paragraphs (1) through (7) of section 371(a) of the Higher Education Act of 1965 (20 U.S.C. 1067q(a)).

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

(6) SECRETARY.—The term ''Secretary'' means the Secretary of Energy.

(7) TRIBAL COLLEGE AND UNIVERSITY.—The term ''Tribal College and University'' has the meaning given in section 316 of the Higher Education Act of 1965 (20 U.S.C. 1059c).

SEC. 3. FINDINGS.

Congress finds that—

(1) the coming end of Moore's Law presents major technological challenges and opportunities for the United States and important implications for national security, economic competitiveness, and scientific discovery;

(2) future progress and innovation in microelectronics, and maintaining a robust domestic microelectronics supply chain, will require an approach that advances relevant materials science, electronic and photonic device technologies, processing and packaging technologies, manufacturing technologies, circuit, chip, and system architecture, and software system and algorithm development in a co-design fashion;

(3) the National Laboratories possess unique technical expertise and user facilities that are essential to overcoming foundational research challenges relevant to the topics described in paragraph (2), and translating and transferring research outcomes to industry; and

(4) the assets described in paragraph (3) will enable the Department to drive advances in microelectronics that are essential to meeting future needs in areas critical to its mission as well as the future

competitiveness of the domestic microelectronics industry, including high-performance computing, emerging data-centric computing approaches, and energy-efficient computing; optical sensors, sources, and wireless networks; and power electronics and electricity delivery systems.

SEC. 4. MICROELECTRONICS RESEARCH PROGRAM.

(a) IN GENERAL.—The Secretary shall carry out a cross-cutting program of research, development, and demonstration of microelectronics relevant to the mission of the Department and in the service of the Nation's global competitiveness in the field of microelectronics.

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

(1) foundational science areas, including—

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

(B) novel microelectronics devices, including emerging memory and storage technologies;

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

(D) data-driven modeling and simulation;

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

(F) component integration and subsystems;

(G) photonic integration; and

(H) development of co-design frameworks for all stages of microelectronics design, development, fabrication, and application;

(2) methods for leveraging advanced simulation, artificial intelligence, and machine learning to enhance co-design and discovery in microelectronics;

(3) in consultation with the National Institute of Standards and Technology, fabrication and processing science and metrology associated with microelectronics manufacturing, including lithography, patterning, surface deposition, etching, and cleaning;

(4) approaches for optimizing system-level advanced computing energy efficiency for the electrical grid, power electronics, and other energy infrastructure;

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

(6) enhancement of microelectronics security, including the development of integrated devices, packages, and thermal management for severe environments and national security.

(c) ELIGIBLE ENTITIES.—The entities eligible to receive financial assistance under this section include—

(1) an institution of higher education, including historically Black colleges and universities, Tribal colleges and universities, and minority serving institutions;

(2) a nonprofit research organization;

(3) a State research agency;

(4) a National Laboratory;

(5) a private commercial entity;

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

(7) any other entities the Secretary deems appropriate.

(d) TECHNOLOGY TRANSFER.—In carrying out the program described in subsection (a), the Secretary, in coordination with the Director of the Office of Technology Transitions shall support translational research and transfer of microelectronics technologies for the benefit of United States economic competitiveness.

(e) EDUCATION AND OUTREACH.—In carrying out the program under subsection (a), the Secretary shall support education and outreach activities to disseminate information and promote public understanding of microelectronics and the microelectronics workforce.

(f) REPORT.—Not less than 180 days after the enactment of this Act, the Secretary shall submit to the Committee on Science, Space, and Technology of the House of Representatives, and the Committee on Energy and Natural Resources of the Senate, a report describing the goals, priorities, and anticipated outcomes of the program described in subsection (a).

(g) FUNDING.—There are authorized to be appropriated to the Secretary to carry out the activities described in this section—

(1) $75,000,000 for fiscal year 2022;

(2) $100,000,000 for fiscal year 2023;

(3) $100,000,000 for fiscal year 2024;

(4) $100,000,000 for fiscal year 2025; and

(5) $100,000,000 for fiscal year 2026.

SEC. 5. MICROELECTRONICS SCIENCE RESEARCH CENTERS.

(a) IN GENERAL.—In carrying out the program under section 4, the Secretary, acting through the Director of the Office of Science, shall establish up to four Microelectronics Science Research Centers (referred to in this section as ''Centers'') to conduct mission-driven research to address foundational challenges in the design, development, and fabrication of microelectronics and to facilitate the translation of research results to industry.

(b) ACTIVITIES.—The activities of the Centers authorized under this section shall include research, development, and demonstration activities for—

(1) accelerating the development of new microelectronics science and technology, including materials, devices, circuits, systems, architectures, fabrication tools, processes, diagnostics, modeling, synthesis, and metrology;

(2) advancing the sustainability and energy efficiency of new microelectronics devices, packages, and systems;

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

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

(5) creating technology testbeds for prototyping platforms for validation and verification of new capabilities and sharing of ideas, intellectual property, and the unique facilities of the Department; and

(6) supporting long-term and short-term workforce development in microelectronics.

(c) REQUIREMENTS.—

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

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

(3) ELIGIBLE APPLICANTS.—The Director of the Office of Science shall consider applications from National Laboratories, institutions of higher education, research centers, or a consortia thereof, or any other entity that the Secretary of Energy deems appropriate.

(4) RENEWAL.—After the end of either period described in paragraph (1), the Director of the Office of Science may renew support for the Center for a period of not more than 5 years on a merit-reviewed basis. For a Center in operation for 10 years

after its previous selection on a competitive, merit-reviewed basis, the Director may renew support for the center on a competitive, merit-reviewed basis for a period of not more than 5 years, and may subsequently provide an additional renewal on a merit-reviewed basis for a period of not more than 5 years.

(5) TERMINATION.—Consistent with the existing authorities of the Department, the Director of the Office of Science may terminate an underperforming center for cause during the performance period.

(d) TECHNOLOGY TRANSFER.—The Director of the Office of Science, in coordination with the Director of the Office of Technology Transitions, shall implement partnerships with industry groups for the purpose of facilitating the translation and transfer of research results produced by the Centers.

(e) COORDINATION.—The Secretary shall—

(1) establish a coordinating network to coordinate cross-cutting research and foster communication and collaboration among the Centers; and

(2) ensure the coordination, and avoid unnecessary duplication, of the activities of each Center with the activities of—

(A) other research entities of the Department, including—

(i) the Nanoscale Science Research Centers;

(ii) the National Quantum Information Science Research Centers;

(iii) the Energy Frontier Research Centers;

(iv) the Energy Innovation Hubs; and

(v) the National Laboratories;

(B) the National Semiconductor Technology Center authorized in title XCIX of division H of the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 (Public Law 116–283);

(C) institutions of higher education;

(D) industry; and

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

(f) FUNDING.—The Secretary of Energy shall allocate up to $25,000,000 for each Center established under this section for each of fiscal years 2022 through 2026, subject to the availability of appropriations.

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