

MICROELECTRONICS RESEARCH FOR ENERGY
INNOVATION ACT

AUGUST 19, 2022.—Committed to the Committee of the Whole House on the State
of the Union and ordered to be printed

Ms. JOHNSON of Texas, from the Committee on Science, Space, and
Technology, submitted the following

R E P O R T

[To accompany H.R. 6291]

The Committee on Science, Space, and Technology, to whom was referred the bill (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, having considered the same, reports favorably thereon with an amendment and recommends that the bill as amended do pass.

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The amendment is as follows:

Strike all after the enacting clause and insert the following:

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) **SKILLED TECHNICAL WORKFORCE.**—The term “skilled technical workforce” has the meaning given such term in section 4(b) of the Innovations in Mentoring, Training, and Apprenticeships Act (42 U.S.C. 1862p).
- (8) **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 missions 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. In carrying out this program, the Secretary shall coordinate across all relevant programs and offices of the Department.

(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) cybersecurity by design to result in trusted and resilient microelectronics;
- (3) methods for leveraging advanced simulation and artificial intelligence to enhance co-design and discovery in microelectronics;
- (4) 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;
- (5) approaches for optimizing system-level energy efficiency of advanced computing systems, the electrical grid, power electronics, and other energy infrastructure;
- (6) approaches for enhancing the durability and lifetime of radiation-hardened electronics;
- (7) enhancement of microelectronics security, including the development of integrated devices, packages, and thermal management for severe environments and national security; and
- (8) in coordination with other relevant initiatives at the Department, methods to improve the lifetime, maintenance, decommissioning, recycling, reuse, and sustainability of microelectronics components and systems, including technologies and strategies that reduce the use of energy, water, critical materials, and other commodities that are determined to be vulnerable to disruption.
- (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, and in consultation with the private sector, shall support translational research and transfer of microelectronics technologies and identify emerging research and development needs of industry and government for the benefit of United States economic competitiveness.
- (e) WORKFORCE DEVELOPMENT.—In carrying out the program under subsection (a), the Secretary shall support—
 - (1) workforce development through the existing authorities and mechanisms available to the Department, including internships, fellowships, individual investigator grants, and other activities the Secretary deems appropriate; and
 - (2) education and outreach activities to disseminate information and promote understanding of microelectronics and related fields among students at K-12, undergraduate, and graduate levels. Such activities may include educational programming with an emphasis on experiential and project-based learning. The Secretary shall consult with the Director of the National Science Foundation on activities carried out this paragraph.
- (f) OUTREACH.—In carrying out activities under subsection (e), the Secretary shall ensure program outreach to recruit applicants and engage participants from all regions of the country, especially underserved communities and groups historically underrepresented in STEM.
- (g) 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).
- (h) 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, characterization, prototyping, demonstration, 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, in consultation with the National Institute of Standards and Technology, 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, 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;

(6) supporting development of cybersecurity capabilities for computing architectures that measurably improve safety and security, and that are adaptable for existing and future applications; and

(7) 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—

(A) National Laboratories;

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

(C) private industry;

(D) research centers;

(E) consortia of 2 or more of the entities described in subparagraphs (A) through (D); and

(F) 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;
 - (v) the National Laboratories; and
 - (vi) other offices of the Department;
 - (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) **WORKFORCE DEVELOPMENT.**—Centers established under this section shall support workforce development through—
- (1) incorporation of undergraduate students, postdoctoral fellows, graduate students, and early career researchers, as well as K-12 students through opportunities such as dual-enrollment programs and work-based learning programs, as applicable;
 - (2) hand-on research and equipment training programs;
 - (3) technical training and certificate programs for the skilled technical workforce;
 - (4) facilitation of engagement between academic, industry, and laboratory researchers; and
 - (5) public outreach activities, including to students at K-12, undergraduate, and graduate levels. Such activities may include educational programming with an emphasis on experiential and project-based learning.
- (g) **OUTREACH.**—In carrying out activities under subsection (e), the Secretary shall ensure program outreach to recruit applicants and engage participants from all regions of the country, especially underserved communities and groups historically underrepresented in STEM.
- (h) **INTELLECTUAL PROPERTY.**—The Secretary shall ensure that the intellectual property and value proposition created by the Centers are retained within the United States.
- (i) **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.

II. PURPOSE OF THE BILL

The purpose of the bill is to direct the Secretary of Energy to carry out a crosscutting initiative in microelectronics research, development, and demonstration (RD&D). This includes research activities aimed at driving progress in the scientific areas underpinning microelectronics, as well as a mechanism for supporting large-scale Microelectronics Science Research Centers focused on addressing specific challenges. H.R. 6291 is sponsored by Mr. Tonko and cosponsored by Mr. Ellzey, Ms. Stevens, Mr. Gimenez, and Ms. Wild.

III. BACKGROUND AND NEED FOR THE LEGISLATION

This legislation establishes the Department of Energy’s (the Department or DOE) role in the broader microelectronics research, development, and demonstration (RD&D) enterprise. DOE’s unique technical expertise and user facilities, as well as the external research community that engages regularly with the Department, render it well-positioned to accelerate transformational research in microelectronics that is essential to meeting future mission needs and bolstering the competitiveness of the domestic microelectronics industry.

The Microelectronics Research for Energy Innovation Act (Micro Act) addresses a gap in the nation’s microelectronics RD&D enterprise by complementing the *Creating Helpful Incentives to Produce*

Semiconductors Act (CHIPS Act). The CHIPS Act, which was enacted in early 2021 as part of the William M. Thornberry National Defense Authorization Act for Fiscal Year 2021, includes authorization of a new National Semiconductor Technology Center (NSTC) focused on research and prototyping of advanced semiconductor concepts in partnership with the private sector, as well as research at the National Institute of Standards and Technology (NIST) to drive advances in measurement science, standards, materials characterization, instrumentation, testing, and manufacturing capabilities. The activities authorized in the Micro Act are intended to accelerate early-stage research that could support NSTC and the NIST-led efforts, which primarily target downstream technology development.

IV. COMMITTEE HEARINGS

Pursuant to clause 3(c)(6) of rule XIII of the Rules of the House of Representatives, the Committee designates the following hearing as having been used to develop or consider the legislation:

On Thursday, December 2, 2021, the Committee on Science, Space, and Technology held a hearing entitled “Ensuring American Leadership in Microelectronics” to examine the status of U.S. leadership in advanced microelectronics development and manufacturing; to discuss how new investments and partnership models can support continued U.S. leadership; and to explore the role of the federal government in supporting domestic microelectronics innovation and manufacturing throughout the supply chain. An additional purpose of the hearing was to receive testimony on the Micro Act and the role of DOE and the National Laboratories in supporting transformative research in microelectronics advances generally.

Witnesses:

- Dr. Ann Kelleher, Executive Vice President and General Manager of Technology Development, Intel Corporation
- Mr. Manish Bhatia, Executive Vice President, Global Operations, Micron Technology, Inc.
- Dr. Michael Witherell, Director, Lawrence Berkeley National Laboratory
- Dr. Mung Chiang, Executive Vice President and John A. Edwardson Dean, College of Engineering, Purdue University

V. COMMITTEE CONSIDERATION AND VOTES

The Committee on Science, Space, and Technology met to consider H.R. 6291 on January 19, 2022.

Mr. Tonko offered an amendment to make technical corrections and conforming changes. *The amendment was agreed to by a voice vote.*

Mr. Perlmutter offered an amendment, on behalf of Mr. Bowman, to authorize specific workforce development and education and public outreach activities. *The amendment was agreed to by a voice vote.*

Ms. Wild offered an amendment to authorize research to improve the lifetime and sustainability of microelectronics components, including energy, water, and critical mineral use. *The amendment was agreed to by a voice vote.*

Mr. Gimenez offered an amendment to require DOE to consult with the private sector in carrying out technology transfer activities under the microelectronics research program. *The amendment was agreed to by a voice vote.*

Mr. Perlmutter moved that the Committee favorably report the bill, H.R. 6291, as amended, to the House of Representatives with the recommendation that the bill be approved. *The motion was agreed to by a voice vote.*

VI. SUMMARY OF MAJOR PROVISIONS OF THE BILL

H.R. 6291 authorizes the Secretary of Energy to carry out a crosscutting initiative in microelectronics RD&D. This would include research activities aimed at driving progress in the scientific areas underpinning microelectronics. Research supported under this initiative will leverage the Department's assets to focus on a broad array of topics including materials science, plasma sciences, fabrication, device architecture, energy efficient computing, and grid optimization, among many others.

The bill also authorizes the establishment of up to four Microelectronics Science Research Centers (MSRCs). These large-scale centers will conduct mission-driven research to address foundational challenges in the design, development, characterization, prototyping, demonstration, and fabrication of microelectronics. The MSRCs will be multi-institutional endeavors involving National Laboratories, universities, and private sector partners, and will seek to advance high-impact research, facilitate technology transfer, and contribute to the future microelectronics workforce.

H.R. 6291 authorizes workforce development and education and public outreach efforts designed to augment the activities carried out through both the broad research initiative and the MSRCs. Specific attention is paid to engaging students and other participants from underserved communities and groups historically underrepresented in science, technology, engineering, and mathematics.

VII. SECTION-BY-SECTION ANALYSIS (BY TITLE AND SECTION)

Sec. 1. Short title

Establishes that H.R. 6291 may be cited as the "Microelectronics Research for Energy Innovation Act".

Sec. 2. Definitions

Definitions.

Sec. 3. Findings

Findings relevant to the subtitle.

Sec. 4. Microelectronics research program

Directs the Secretary of Energy to carry out a crosscutting program in microelectronics research, development, and demonstration and authorizes appropriations for those purposes. The section also authorizes activities in workforce development and outreach pursuant to the program and authorizes the Secretary to consult with the National Science Foundation on these activities.

Sec. 5. Microelectronics science research centers

Directs the Secretary of Energy to establish up to four Microelectronics Science Research Centers to conduct mission-driven research and associated workforce development activities to address foundational challenges in the design, development characterization, prototyping, demonstration, and fabrication of microelectronics and to facilitate the translation of research results to industry, and authorizes appropriations for this purpose.

VIII. COMMITTEE VIEWS

In implementing this program, the Committee encourages the Department to prioritize coordination between the appropriate program offices and with relevant Federal agencies. The Committee continues to emphasize the importance of leveraging the unique capabilities of the Department, including its National Laboratories, user facilities, and external research partners, to drive innovations in microelectronics relevant to its mission and to enable advances and breakthroughs in ways that are not currently feasible using existing mechanisms and programs.

IX. COST ESTIMATE

Pursuant to clause 3(c)(2) of rule XIII of the Rules of the House of Representatives, the Committee adopts as its own the estimate of new budget authority, entitlement authority, or tax expenditures or revenues contained in the cost estimate prepared by the Director of the Congressional Budget Office pursuant to section 402 of the Congressional Budget Act of 1974.

X. CONGRESSIONAL BUDGET OFFICE COST ESTIMATE

No Congressional Budget Office cost estimate.

XI. FEDERAL MANDATES STATEMENT

H.R. 6291 contains no unfunded mandates.

XII. COMMITTEE OVERSIGHT FINDINGS AND RECOMMENDATIONS

The Committee's oversight findings and recommendations are reflected in the body of this report.

XIII. STATEMENT ON GENERAL PERFORMANCE GOALS AND OBJECTIVES

Pursuant to clause (3)(c)(4) of rule XIII of the Rules of the House of Representatives, the goal of H.R. 6291 is to strengthen the nation's microelectronics research enterprise and help foster a robust domestic microelectronics sector. The legislation will require the Department to provide a report on the implementation of the authorized program.

XIV. FEDERAL ADVISORY COMMITTEE STATEMENT

No Federal Advisory Committees are created by H.R. 6291.

XV. DUPLICATION OF FEDERAL PROGRAMS

Pursuant to clause 3(c)(5) of rule XIII of the Rules of the House of Representatives, the Committee finds that no provision of H.R. 6291 establishes or reauthorizes a program of the federal govern-

ment known to be duplicative of another federal program, including any program that was included in a report to Congress pursuant to section 21 of Public Law 111–139 or the most recent Catalog of Federal Domestic Assistance.

XVI. EARMARK IDENTIFICATION

Pursuant to clauses 9(e), 9(f), and 9(g) of rule XXI, the Committee finds that H.R. 6291 contains no earmarks, limited tax benefits, or limited tariff benefits.

XVII. APPLICABILITY TO THE LEGISLATIVE BRANCH

The Committee finds that H.R. 6291 does not relate to the terms and conditions of employment or access to public services or accommodations within the meaning of section 102(b)(3) of the Congressional Accountability Act (Public Law 104–1).

XVIII. STATEMENT ON PREEMPTION OF STATE, LOCAL, OR TRIBAL LAW

This bill is not intended to preempt any state, local, or tribal law.

XIX. PROCEEDINGS OF THE FULL COMMITTEE MARKUP

**MARKUP: H.R. 847, THE PROMOTING DIGITAL
PRIVACY TECHNOLOGIES ACT; H.R. 4270, THE
ABANDONED WELL REMEDIATION RE-
SEARCH AND DEVELOPMENT ACT; H.R. 4521,
THE BIOECONOMY RESEARCH AND DEVEL-
OPMENT ACT OF 2021; H.R. 4819, THE NA-
TIONAL NUCLEAR UNIVERSITY RESEARCH
INFRASTRUCTURE REINVESTMENT ACT OF
2021; H.R. 6291, THE MICROELECTRONICS RE-
SEARCH FOR ENERGY INNOVATION ACT OR
"MICRO ACT"**

MARKUP

BEFORE THE

COMMITTEE ON SCIENCE, SPACE,
AND TECHNOLOGY

OF THE

HOUSE OF REPRESENTATIVES

ONE HUNDRED SEVENTEENTH CONGRESS

SECOND SESSION

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MARKUP:
**H.R. 847, THE PROMOTING DIGITAL PRIVACY
TECHNOLOGIES ACT**

**H.R. 4270, THE ABANDONED WELL REMEDI-
ATION RESEARCH AND DEVELOPMENT ACT**

**H.R. 4521, THE BIOECONOMY RESEARCH AND
DEVELOPMENT ACT OF 2021**

**H.R. 4819, THE NATIONAL NUCLEAR UNIVER-
SITY RESEARCH INFRASTRUCTURE REIN-
VESTMENT ACT OF 2021**

**H.R. 6291, THE MICROELECTRONICS RE-
SEARCH FOR ENERGY INNOVATION ACT OR
MICRO ACT**

WEDNESDAY, JANUARY 19, 2022

**HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, D.C.**

The Committee met, pursuant to notice, at 10:04 a.m., via Zoom, Hon. Eddie Bernice Johnson [Chairwoman of the Committee] presiding.

Chairwoman JOHNSON. Good morning, and happy New Year. The Committee will come to order. And without objection, the Chair is authorized to declare recess at any time.

Pursuant to Committee rule 2(e) and House rule XI, the Committee announces that we may postpone any request for roll call votes.

Today, the Committee is meeting virtually. I want to announce a couple of reminders to our Members about the conduct of this meeting. First, Members should keep their video feed on as long as they are present in the meeting. Members are responsible for their own microphones. Please also keep your microphones muted unless you are speaking. And finally, if Members have documents they

wish to submit to the record, please email them to the Committee Clerk, whose email address was circulated prior to this meeting.

Pursuant to notice, the Committee meets to consider the following measures: H.R. 4521, the *Bioeconomy Research and Development Act of 2021*; H.R. 847, the *Promoting Digital Privacy—Privacy Technologies Act*; H.R. 4270, the *Abandoned Well Remediation Research and Development Act*; H.R. 4819, the *National Nuclear University Research Infrastructure Reinvestment Act of 2021*; H.R. 6291, the *Microelectronics Research for Energy Innovation Act*, or the *Micro Act*.

Let me welcome all of you to the first Science Committee markup of 2022. Today, we're marking up those five good bipartisan bills. The first bill to be considered is the *Bioeconomy Research and Development Act*. I want to first thank Ranking Member Lucas for partnering with me on this bill. This legislation creates a national engineering biology initiative in support of U.S. leadership in the 21st century bioeconomy. Advances in engineering biology will drive innovation across nearly all sectors of our economy. Europe and China long ago took steps to implement a bioeconomy strategy. Our own efforts have progressed in fits and starts. The time to implement a coherent national strategy is now. I'll speak more about this bill when it's called up.

The next item we will take up today is *Promoting Digital Privacy Technologies Act*. I want to thank Representative Stevens and Gonzalez for their thoughtful work on this legislation. Privacy-enhancing technologies have the potential to vastly improve the way we protect people's privacy when processing information about them. This bill seeks to accelerate the development of these technologies. It would fund research into privacy-enhancing technologies at the National Science Foundation (NSF). It would also authorize outreach and standards-setting activities at the National Institute of Standards and Technology (NIST). And finally, the bill promotes coordination on the development of these technologies across the Federal Government. Getting privacy right in a way that allows for effective use of information is a difficult challenge. This bill will promote new avenues of research to strike that balance.

I'm happy to be an original cosponsor, along with Ranking Member Lucas, on the next bill we're marking up, *Abandoned Well Remediation Research and Development Act*, introduced by Mr. Lamb and Mrs. Bice. The bipartisan bill creates a research, development, and demonstration program at the Department of Energy to tackle the ever-growing problem of advanced oil and gas well pumps—oil and gas wells in the United States. It would increase the efficiency of remediation, mitigate environmental harms, and reduce methane emissions. It would also improve technologies to enable the widespread mapping of unrecorded abandoned wells across the country, some of which can date back as far as 1850's. As we transition to a clean energy economy, it is critical that we have sound and proven technologies to mitigate the harmful methane emissions of hundreds of thousands if not millions of abandoned wells in our communities.

The next bill we will consider is the *National Nuclear University Research Infrastructure Reinvestment Act of 2021* introduced by Representatives Gonzalez, Foster, Casten, and Meijer. This bill

builds off historic nuclear energy research and development (R&D) legislation enacted into law as a part of the *Energy Act of 2020*. The bill has two major thrusts: first, to ensure existing nuclear energy university infrastructure is well-maintained and potentially upgraded; and second, to build new nuclear science and engineering university facilities. And the bill also places strong emphasis on ensuring all activities included—include a wide variety of participants beyond those who already have established nuclear science capabilities, including historically Black colleges and universities (HBCU), tribal colleges, or universities of other minority-serving institutions.

And finally, the last bill we'll consider today is the *Microelectronics Research for Energy Innovation Act*, which was sponsored by Representatives Tonko and Ellzey. This legislation seeks to leverage the unique capabilities and technical expertise of the Department of Energy to accelerate transformative advancements in the field of microelectronics, which play an increasingly significant role in our daily lives and which are essential to maintaining U.S. national security and global economic and scientific leadership. Specifically, this bill would direct the Secretary of Energy to carry out a crosscutting initiative in microelectronics, including research activities aimed at driving progress in related scientific fields, as well as large-scale center-based efforts focused on addressing specific challenges. The bill also includes an emphasis on work force development, education, and outreach to ensure that we're engaging students of all ages in this exciting field and laying the groundwork for the microelectronics work force of the future. I urge my colleagues to support this important legislation.

And finally, I want to address a topic that came up very late in this process. Groups approached us yesterday afternoon asking to add the Davis-Bacon prevailing wage requirements to three of the bills we are marking up today. This was much too late in the process to try and deal with this issue. While I am a supporter of Davis-Bacon, some of my friends on the other side of the aisle are not. Trying to address this issue while maintaining strong bipartisan support is something that simply cannot be done in a hasty fashion. I know the gentleman from New Jersey is a strong advocate for Davis-Bacon, and I'd like to try and find a path forward on this issue as we move forward. However, I don't want to sugarcoat how difficult addressing this issue will be while maintaining bipartisan support of the legislation.

Now, let me just say a little bit about my history with labor. My first job as a supervisor at the VA (Veterans Affairs) hospital in Dallas, Texas, I organized a union when I could not be a member. I support unions. I am a dues-paying member of a union right now. I am not antiunion, but we do have to consider timeliness and appropriateness as we move forth in this scientific direction of our responsibilities in this Committee.

[The prepared statement of Chairwoman Johnson follows:]

Welcome to the first Science Committee markup of 2022. Today we are marking up five good bipartisan bills.

The first bill to be considered is the *Bioeconomy Research and Development Act*. I first want to thank Ranking Member Lucas for partnering with me on this bill. This legislation creates a national engineering biology initiative in support of U.S. leadership in the 21st Century Bioeconomy.

Advances in engineering biology will drive innovation across nearly all sectors of our economy. Europe and China long ago took steps to implement a bioeconomy strategy. Our own efforts have progressed in fits and starts. The time to implement a coherent national strategy is now. I'll speak more about this bill when we call it up.

The next item we will take up today is the *Promoting Digital Privacy Technologies Act*. I want to thank Representatives Stevens and Gonzalez for their thoughtful work on this legislation. Privacy-enhancing technologies (PETs) have the potential to vastly improve the way we protect peoples' privacy when processing information about them. This bill seeks to accelerate the development of these technologies. It would fund research into privacy-enhancing technologies at the National Science Foundation. It would also authorize outreach and standard-setting activities at the National Institute of Standards and Technology. Finally, the bill promotes coordination on the development of these technologies across the Federal government. Getting privacy right in a way that allows for the effective use of information is a difficult challenge. This bill will promote new avenues of research to strike that balance.

I am happy to be an original cosponsor, along with Ranking Member Lucas, on the next bill we are marking up: the *Abandoned Well Remediation Research and Development Act*, introduced by Mr. Lamb and Ms. Bice. This bipartisan bill creates a research, development, and demonstration program at the Department of Energy to tackle the ever-growing problem of abandoned oil and gas wells in the U.S. It would increase the efficiency of remediation, mitigate environmental harms, and reduce methane emissions. It would also improve technologies to enable the widespread mapping of unrecorded abandoned wells around the country, some of which can date back as far as the 1850s. As we transition to a clean energy economy, it is critical that we have sound and proven technologies to mitigate the harmful methane emissions of hundreds of thousands, if not millions of abandoned wells in our communities.

The next bill we will consider is the *National Nuclear University Research Infrastructure Reinvestment Act of 2021*, introduced by Representatives Gonzalez, Foster, Casten, and Meijer. This bill builds off historic nuclear energy research and development legislation enacted into law as part of the *Energy Act of 2020*.

The bill has two major thrusts - first, to ensure existing nuclear energy university infrastructure is well-maintained and potentially upgraded; and second, to build new nuclear science and engineering university facilities. And the bill also places strong emphasis on ensuring all activities include a wide variety of participants beyond those who already have established nuclear science capabilities, including historically Black colleges and universities, Tribal colleges or universities, and other minority-serving institutions.

Finally, the last bill we will consider to today is the *Microelectronics Research for Energy Innovation Act*, which was sponsored by Representatives Tonko and Ellzey. This legislation seeks to leverage the unique capabilities and technical expertise of the Department of Energy to accelerate transformational advancements in the field of microelectronics, which play an increasingly significant role in our daily lives, and which are essential to maintaining U.S. national security and global economic and scientific leadership. Specifically, this bill would direct the Secretary of Energy to carry out a crosscutting initiative in microelectronics, including research activities aimed at driving progress in related scientific fields as well as large-scale, center-based efforts focused on addressing specific challenges. The bill also includes an emphasis on workforce development, education, and outreach to ensure that we are engaging students of all ages in this exciting field and laying the groundwork for the microelectronics workforce of the future. I urge my colleagues to support this important legislation.

Finally, I want to address a topic that came up very late in the process. Groups approached us yesterday afternoon asking to add in Davis Bacon prevailing wage requirements to three of the bills we are marking up today. This was much too late in the process to try and deal with this issue. While I am a supporter of Davis Bacon, some of my friends on the other side of the aisle are not. Trying to address this issue while maintaining strong bipartisan support is something that simply could not be done in a hasty fashion.

I know the gentleman from New Jersey is a strong advocate for Davis Bacon, and I would like to try and find a path forward on this issue as we move forward. However, I don't want to sugar coat how difficult addressing this issue will be while maintaining bipartisan support for the legislation.

Chairwoman JOHNSON. Now, I will recognize our Ranking Member, Mr. Lucas, for his opening remarks.

Mr. LUCAS. Thank you, Chairwoman Johnson, for holding today's markup. This morning we will consider five bipartisan bills. The first, the *Bioeconomy Research and Development Act of 2021*, is a bill I am proud to sponsor with the Chairwoman. I'll discuss this legislation further when the Chair brings it up for debate and I'll offer an amendment.

The second bill is H.R. 847, the *Promoting Digital Privacy Technologies Act*. This legislation supports research activities to advance innovative technologies to safeguard every individuals' privacy. As advanced technologies like AI (artificial intelligence) begin accessing and analyzing large data sets, it will be critical we have technologies to ensure people's personally identity information is protected.

The legislation also directs NIST to work with stakeholders to develop voluntary consensus standards for incorporating these technologies into Federal and commercial applications. I want to thank Chairwoman Stevens and Representative Gonzalez for leading this important legislation. I encourage my colleagues to support the bill.

The third bill is H.R. 4270, the *Abandoned Well Remediation Research and Development Act*. This legislation authorizes DOE (Department of Energy) to conduct research on issues surrounding abandoned wells. The bill will allow us to improve data on the location of abandoned wells; identify better processes for plugging, reclaiming, and repurposing wells; and help us mitigate the potential environmental impacts of leaking wells.

This is a major issue for Oklahoma and my district. Drive across the State and you'll see countless wells sitting on top of some of the world's largest gas and oil fields. This bill will help give producers, landowners, and State and local governments the tools they need to manage these wells. I applaud my fellow Oklahoman, Representative Stephanie Bice, for working with Representative Lamb on this important bipartisan legislation.

The fourth bill we'll consider is H.R. 4819, the *National Nuclear University Research Infrastructure Reinvestment Act of 2021*. The bill, authored by Representative Anthony Gonzalez, builds off of improvements to the Nuclear Energy University Program included in the *Energy Act of 2020*. It will establish up to four new university-based research reactors, which would be able to collaborate and help the Advanced Reactor Demonstration Program and the Low-Dose Radiation Program.

I thank Representative Gonzalez and Representative Foster for working together on this bipartisan bill to advance our Nation's nuclear energy capacities. Nuclear energy is critical to our Nation's energy security and independence. This bill will help ensure we are developing the work force and advanced reactors of the future to make this a reality.

Finally, we'll consider H.R. 6291, the *Microelectronics Research for Energy Innovation Act*, or the *Micro Act*. The bill directs DOE to carry out a crosscutting research, development, and demonstration program on microelectronics to accelerate U.S. global competitiveness in this critical technology area. DOE possesses unique technical expertise and research infrastructure that can help drive the development of the next generation of microelectronics. The De-

partment and its world-leading national laboratory system must play a significant role in our Federal strategy to shore up our international competitiveness in the microelectronics field and confront related national security threats.

The legislation complements the *CHIPS Act*, signed into law last year, to address the decline of domestic semiconductor manufacturing and promote advanced semiconductor development in the United States. The *Micro Act* will help ensure DOE's critical participation in this work and should be considered alongside *DOE Science for the Future Act* as an essential component of a U.S. competitiveness legislation package. I want thank Representative Tonko and Representative Ellzey for working on this important bipartisan piece of legislation.

Each of these bills harnesses America's incredible scientific and technological prowess to address pressing challenges and improve our future. This is a great example of what the Science Committee can do when we work together.

I want to thank Chairwoman Johnson and her staff for working collaboratively on getting these bills ready for the markup and for working through the amendments we'll consider today. I have every expectation this will be both a productive and a collegial markup.

And with that, I enthusiastically yield back, Madam Chair.

Chairwoman JOHNSON. Thank you very much, Mr. Lucas.

I see that Mr. Norcross has his hand up. I recognize you.

Mr. NORCROSS. Thank you, Madam Chairwoman, and appreciate the recognition to you and the Ranking Member. The issue of Davis-Bacon coming up at the last moment certainly is something that we wish we could get with much earlier. There is nothing new about Davis-Bacon. But if we look to expand the standards across the board, nontraditional, education, things of that nature, Davis-Bacon is incredibly important. We are finding trouble getting those working men and women into the trades right now. This will only make things worse when we exclude those. So I very much appreciate the fact that we're having the discussion.

And in fact, I would suggest it's not an either/or but it is both. We need the best research and we need the best people to help build those things, so moving forward, very much want to have the conversation where it's a win-win and not trying to limit those and build these facilities and hurting them. So, again, I appreciate—and I've spoken to many Members of the Committee. We'll try to address this earlier on but very much appreciate because on the other side of the Capitol, the Senate has included Davis-Bacon in much of the things that are going to be included, so I think we're going to have an opportunity and just wanted to again thank the Ranking Member and Chairwoman for working with us.

Chairwoman JOHNSON. Thank you very much.

We will now consider H.R. 4521, the *Bioeconomy Research and Development Act of 2021*. The Clerk will report the bill.

STAFF. She's muted. I don't know if she knows she's muted. You're muted, Clerk.

Now, we will consider H.R. 6291. The Clerk will report the bill. The CLERK. H.R. 6291, to provide for a comprehensive and integrated program to accelerate microelectronics research and development at the Department of Energy and other—and for other purposes.

[The bill follows:]

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—

29

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11

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.

○

Mr. PERLMUTTER. Without objection, the bill is considered as read and open to amendment at any point.

Mr. TONKO. Mr. Chair, you're muted, I believe.

Mr. PERLMUTTER. Oh, yes, I am. I—geez, I was doing such a good job. I guess we could better—OK. Is there anyone who wishes to be recognized on this particular bill?

Mr. TONKO. Mr. Chair, Mr. Tonko here looking for recognition.

Mr. PERLMUTTER. Mr. Tonko, you are certainly recognized for 5 minutes to—

Mr. TONKO. Well, thank you, Mr. Chair. Let me thank Chairman—Chairwoman Johnson and the entire Committee for the work they've done, but especially her leadership. And she will be sorely missed because we've had great accomplishments through the Committee. And likewise, we'll be sad to see the Reps who are leaving, Mr. McNerney and Mr. Perlmutter, sir, Mr. Chair, and Mr. Gonzalez, great contributions to the Committee and know that your work is very much appreciated and we wish you well.

To the bill, every day without knowing it we use countless microelectronics to carry out our daily routines. Browsing the web, watching TV, driving to work, or turning on the coffeemaker, these ordinary tasks are made possible because of microelectronics. Even more importantly, they keep ATMs (automated teller machines), trains, traffic lights, and medical networks operating soundly and are essential to our military for aircraft communications and other critical technology.

Meanwhile, the adoption of new consumer and commercial electronics is growing at an accelerated pace. Not only are consumers buying more devices per household, but the data generated by this connectivity is rapidly exploding the need for data storage. Furthermore, getting to the next level of energy efficiency is going to require incredible leaps in microelectronics R&D.

As our reliance on microelectronics in everyday life continues to grow, we must leverage strategic investments across government and industry to advance transformative solutions in microelectronics. This is vital to our Nation's long-term economic and manufacturing competitiveness.

My colleague Mr. Ellzey and I have been working together to do just that. We recognize that our Nation has long been a global leader in the research and development of this technology. Particularly in my district, New York's capital region, has been home to trailblazers in this industry for over 2 decades. Long-term partnerships amongst our academic institutions, regional industry, and government have enabled major breakthroughs in innovation in microchip technology over the years. So our *Microelectronics Research for Energy Innovation*, or *Micro Act*, seeks to leverage the unique assets that the Department of Energy has at its disposal. Those assets include its national labs, scientific user facilities, and community of external collaborators.

Our bill will authorize a crosscutting research program that focuses on a broad array of topics from materials sciences to plasma sciences and fabrication to device architecture, energy efficiency, and grid optimization, amongst many others. As part of this initiative, the *Micro Act* will direct DOE to establish up to four microelectronics science research centers. These research centers will

feature multi-institutional collaborations aimed at advancing high-impact research, facilitating technology, transferring contributing to the future microelectronics work force.

In so doing, the *Micro Act* will be an important complement to the *CHIPS Act*, which passed at the end of 2020 and is anxiously awaiting congressional action to receive its critical funding. Specifically, this research initiative authorized under the *Micro Act* will address foundational challenges and develop solutions that can feed into the activities authorized by CHIPS, which are more focused on downstream challenges.

Ultimately, our *Micro Act* will bolster the ability of DOE, its partners in industry and academia, and the domestic microelectronics sector in general to leverage new research outcomes that maintain and enhance competitiveness. I urge my colleagues to support this essential piece of legislation so that we may usher in a renewed era of American leadership in microelectronics research and innovation. And I do thank Representative Ellzey for his partnership in this effort. With that, I thank the Committee. I thank you, Mr. Chair, and I yield back.

Mr. PERLMUTTER. The gentleman from New York yields back.

For what purpose does the gentleman from Texas seek to be recognized?

Mr. ELLZEY. Thank you, Mr. Chairman. I'd like to speak on the bill.

Mr. PERLMUTTER. The gentleman from—Mr. Ellzey, you are recognized for 5 minutes.

Mr. ELLZEY. Thank you, Mr. Chairman.

Today, I urge support of H.R. 6291, the *Microelectronics Research for Energy Innovation Act*, also known as *Micro Act*, which I was proud to cosponsor alongside Representative Tonko, and thank—I appreciate him letting me do that.

Before the global pandemic, the United States relied heavily on the global supply chain to manufacture and produce its products. Then came COVID-19. And as governments ordered national lockdowns, our supply chain came to a halt, along with its factories and workers. These actions placed our trade network in disarray, leaving ships and their containers stranded.

When our economy came back online, our supply chain wasn't ready to handle the increased demand, especially products with microelectronics. This led to backlogs at our ports and increased wait times for common goods such as dishwashers and smart devices. The pandemic exposed the weaknesses of our supply chain and the need to develop and produce key resources like microelectronics right here in the United States as they are instrumental to our daily lives and national security.

Congress saw an opportunity to make this desire a reality, starting with the enactment of the *CHIPS Act* in the 2021 NDAA. That was one step in promoting a domestic production base in the United States. The *Micro Act* would build on the success of this legislation by leveraging the unparalleled research and development capabilities of the DOE to accelerate domestic innovation in microelectronics technologies.

This bill directs the Secretary of Energy to work with our universities, nonprofits, companies, national labs, and public-private part-

nerships to advance U.S. competitiveness and create the technologies of tomorrow. The *Micro Act* also directs the Secretary to establish up to four microelectronics science research centers, as addressed earlier by Mr. Tonko.

The *Micro Act* would empower DOE to play a central role in the U.S. microelectronics research initiative, which will improve our ability to lead the world in emerging technologies. It is critical that the United States plays a major role in their development as we will use them to protect our interests and promote freedom across the globe.

This legislation wouldn't have been possible without the leadership of Representative Tonko. His willingness to work across the aisle in a bipartisan manner stands as a testament of what this Committee represents. I hope to continue to work with my colleagues from both sides of the aisle on legislation that spurs U.S. innovation, creates a global—competitive global business environment, and upholds our national security. I ask my colleagues to support the *Micro Act*, and with that, I yield back.

Mr. PERLMUTTER. The gentleman from Texas yields back.

For what purpose does the gentlewoman from North Carolina seek recognition?

Ms. ROSS. Mr. Chair, I move to strike the last word.

Mr. PERLMUTTER. The gentlelady moves to strike the last word. Ms. Ross, you're recognized for 5 minutes.

Ms. ROSS. Thank you, Mr. Chairman.

I also support H.R. 6291, the *Microelectronics Research for Energy Innovation Act*.

Semiconductors are a crucial part of every digital device, powering our phones, cars, and more. Unfortunately, the COVID-19 pandemic revealed how dependent the U.S. economy is on foreign suppliers for microelectronics. The PowerAmerica Institute at NC State University in my district, a public-private partnership among industry, government, national labs, and academia, is currently doing excellent work to accelerate the commercialization of wide bandgap semiconductor technology. However, we must do more to expand these types of programs to ensure that the United States is a global leader in this growing industry.

That's why I'm thrilled that this bill will establish up to four microelectronics science research centers that will require cooperation between national laboratories, universities, and private sector partners to advance the U.S. microelectronics industry.

I urge my colleagues to support the bills before us today, and I yield back.

Mr. PERLMUTTER. The gentlelady yields back.

For what purpose does the gentleman from Illinois seek recognition?

Mr. FOSTER. To strike the last word.

Mr. PERLMUTTER. Mr. Foster, you're recognized for 5 minutes.

Mr. FOSTER. I just want to briefly thank the bill's sponsors for highlighting the role of the Department of Energy in microelectronics research. The research and—the fundamental research and the applied research in the Department of Energy very often has been pushing the state-of-the-art in microelectronics in ways that are not appreciated. And I could go through a long list of them just

from a personal point of view. It was at a Department of Energy workshop back in 1989 that Katherine Newland Holmes and I co-authored a paper on a new type of integrated circuit, a floating-point pipeline digitizer, that has been pushing the state-of-the-art through many generations and feature sizes from—going from microns to nanometers and are currently being used today to take data at the Large Hadron Collider and in other high-energy physics experiments.

And so this is the sort of thing that has to continue, that the advances that are pushed by the necessity of the research, the fundamental research down at the Department of Energy should be allowed to continue to push the state-of-the-art in microelectronics, the way it has been doing for decades. And I thank the sponsors of this bill for highlighting that and continuing efforts in this area. Thanks much, and I yield back.

Mr. PERLMUTTER. The gentleman yields back. I was going to ask the gentleman to describe his experiment, but we want to finish today, so we will proceed to amendments.

The first amendment on the roster is the amendment offered by Mr. Tonko.

Mr. TONKO. Yes, Mr. Chair, this amendment, in coordination—

Mr. PERLMUTTER. I'm sorry, Mr. Tonko—

Mr. TONKO. I have an amendment at the desk.

Mr. PERLMUTTER. OK. The Clerk will report the title.

The CLERK. Amendment to H.R. 6291 offered by Mr. Tonko of New York.

[The amendment of Mr. Tonko follows:]

AMENDMENT TO H.R. 6291**OFFERED BY MR. TONKO OF NEW YORK**

Page 3, line 26, strike “mission” and insert “missions”.

Page 4, line 12, insert at the end the following: “In carrying out this program, the Secretary shall coordinate across all relevant programs and offices of the Department.”.

Page 5, after line 7, insert the following (and redesignate subsequent paragraphs accordingly):

- 1 (2) cybersecurity by design to result in trusted
- 2 and resilient microelectronics;

Page 5, lines 8 and 9, strike “, artificial intelligence, and machine learning” and insert “and artificial intelligence”.

Page 5, line 16, strike “system-level advanced computing energy efficiency for” and insert “system-level energy efficiency of advanced computing systems,”.

Page 7, line 24, insert “characterization, prototyping, demonstration,” after “development,”.

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Page 8, line 8, insert “, in consultation with the National Institute of Standards and Technology,” before “metrology”.

Page 8, line 18, strike “machine learning,”.

Page 8, line 25, strike “and” at the end.

Page 8, after line 25, insert the following (and redesignate the subsequent paragraph accordingly):

- 1 (6) supporting development of cybersecurity ca-
- 2 pabilities for computing architectures that measur-
- 3 ably improve safety and security, and that are
- 4 adaptable for existing and future applications; and

Page 9, strike lines 15 through 20 and insert the following:

- 5 (3) ELIGIBLE APPLICANTS.—The Director of
- 6 the Office of Science shall consider applications
- 7 from—
- 8 (A) National Laboratories;
- 9 (B) institutions of higher education, in-
- 10 cluding historically Black colleges and univer-
- 11 sities, Tribal colleges and universities, and mi-
- 12 nority serving institutions;
- 13 (C) private industry;
- 14 (D) research centers;

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1 (E) consortia of 2 or more of the entities
2 described in subparagraphs (A) through (D);
3 and
4 (F) any other entity that the Secretary of
5 Energy deems appropriate.

Page 11, line 9, strike “and”.

Page 11, line 10, insert “and” at the end.

Page 11, after line 10, insert the following:

6 (vi) other offices of the Department;

Page 11, after line 19, insert the following (and re-designate the subsequent subsection accordingly):

7 (f) INTELLECTUAL PROPERTY.—The Secretary shall
8 ensure that the intellectual property and value proposition
9 created by the Centers are retained within the United
10 States.



Mr. PERLMUTTER. Without objection, the reading of the amendment is dispensed with. The gentleman from New York is recognized for 5 minutes.

Mr. TONKO. Thank you, Mr. Chair.

This amendment, in coordination with DOE, will make technical and conforming changes to account for the many research needs in areas such as cybersecurity and energy efficiency, interoffice and interagency coordination, and protections for IP (intellectual property) and value proposition created by the microelectronics science research centers. It also expands the types of applicants to be considered by the Director of the Office of Science for the research centers to include private industry and its valuable collaborations with higher education, national laboratories, and research centers. I urge my colleagues to support this important and commonsense amendment and yield back the balance of my time, sir.

Mr. PERLMUTTER. The gentleman yields back.

Is there any other discussion on this Tonko amendment?

Seeing none, all those in favor, please say aye to the Tonko amendment.

Those opposed, please say no.

In the opinion of the Chair, the ayes have it, and the amendment is agreed to.

The next amendment on the roster is the amendment from Mr. Bowman, and I will ask the Clerk to read the title to the Bowman amendment.

The CLERK. Amendment No. 2, amendment to H.R. 6291 offered by Mr. Bowman of New York.

[The amendment of Mr. Bowman follows:]

AMENDMENT TO H.R. 6291**OFFERED BY MR. BOWMAN OF NEW YORK**

Page 2, after line 20, insert the following (and redesignate the subsequent paragraph accordingly):

1 (7) SKILLED TECHNICAL WORKFORCE.—The
2 term “skilled technical workforce” has the meaning
3 given such term in section 4(b) of the Innovations
4 in Mentoring, Training, and Apprenticeships Act (42
5 U.S.C. 1862p).

Page 6, strike lines 21 through 25 and insert the following (and redesignate subsequent subsections accordingly):

6 (e) WORKFORCE DEVELOPMENT.—In carrying out
7 the program under subsection (a), the Secretary shall sup-
8 port—

9 (1) workforce development through the existing
10 authorities and mechanisms available to the Depart-
11 ment, including internships, fellowships, individual
12 investigator grants, and other activities the Sec-
13 retary deems appropriate; and

14 (2) education and outreach activities to dissemi-
15 nate information and promote understanding of

1 microelectronics and related fields among students
2 at K-12, undergraduate, and graduate levels. Such
3 activities may include educational programming with
4 an emphasis on experiential and project-based learn-
5 ing. The Secretary shall consult with the Director of
6 the National Science Foundation on activities car-
7 ried out this paragraph.

8 (f) OUTREACH.—In carrying out activities under sub-
9 section (e), the Secretary shall ensure program outreach
10 to recruit applicants and engage participants from all re-
11 gions of the country, especially underserved communities
12 and groups historically underrepresented in STEM.

Page 11, after line 19, insert the following (and re-
designate the subsequent subsection accordingly):

13 (e) WORKFORCE DEVELOPMENT.—Centers estab-
14 lished under this section shall support workforce develop-
15 ment through—

16 (1) incorporation of undergraduate students,
17 postdoctoral fellows, graduate students, and early
18 career researchers, as well as K-12 students through
19 opportunities such as dual-enrollment programs and
20 work-based learning programs, as applicable;

21 (2) hand-on research and equipment training
22 programs;

1 (3) technical training and certificate programs
2 for the skilled technical workforce;

3 (4) facilitation of engagement between aca-
4 demic, industry, and laboratory researchers; and

5 (5) public outreach activities, including to stu-
6 dents at K-12, undergraduate, and graduate levels.
7 Such activities may include educational program-
8 ming with an emphasis on experiential and project-
9 based learning.

10 (f) OUTREACH.—In carrying out activities under sub-
11 section (e), the Secretary shall ensure program outreach
12 to recruit applicants and engage participants from all re-
13 gions of the country, especially underserved communities
14 and groups historically underrepresented in STEM.



Mr. PERLMUTTER. Without objection, the reading of the amendment is dispensed with, and Mr. Bowman had to step aside for a second so I'll recognize myself to speak on his amendment.

I thank Representative Bowman for his amendment. This amendment would strengthen the work force development, education, and outreach provisions of the *Micro Act* by authorizing specific activities for supporting and engaging students at all levels, especially those groups that have historically been under-representatives in STEM—underrepresented in STEM fields. These include experiential and project-based learning, dual enrollment, and worked-based learning programs, hands-on research and equipment training, technical training, and certification programs.

Given our increasing global competition over leadership in microelectronics, it is critical that we lay a strong foundation on which to develop the next-generation work force that will help ensure U.S. leadership in this area well into the future.

With that, I will yield back and see if there is anybody else who would like to be recognized on Mr. Bowman's amendment.

Seeing none, the question will be on the Bowman amendment.

All those in favor, please say aye.

All those opposed, please say no.

In the opinion of the Chair, the ayes have it, and Mr. Bowman's amendment is agreed to.

The next amendment on the roster is the amendment of the gentlelady from Pennsylvania, Ms. Wild. And she—do you have an amendment at the desk?

Ms. WILD. Yes, Mr. Chair, I do.

Mr. PERLMUTTER. OK. The Clerk will report the title.

The CLERK. Amendment No. 3, amendment to H.R. 6291 offered by Ms. Wild of Pennsylvania.

[The amendment of Ms. Wild follows:]

AMENDMENT TO H.R. 6291**OFFERED BY MS. WILD OF PENNSYLVANIA**

Page 5, line 21, strike “and”.

Page 5, line 25, strike the period and insert “; and”.

Page 5, after line 25, insert the following:

1 (7) in coordination with other relevant initia-
2 tives at the Department, methods to improve the
3 lifetime, maintenance, decommissioning, recycling,
4 reuse, and sustainability of microelectronics compo-
5 nents and systems, including technologies and strat-
6 egies that reduce the use of energy, water, critical
7 materials, and other commodities that are deter-
8 mined to be vulnerable to disruption.



Mr. PERLMUTTER. Without objection, the reading of the amendment is dispensed with, and Ms. Wild is recognized for 5 minutes.
Ms. WILD. Thank you so much, Mr. Chair.

As the Representative for Pennsylvania's 7th District, which covers the greater Lehigh Valley of Pennsylvania, I meet regularly with industries in my district, and I hear a constant refrain, that a shortage of semiconductors are hobbling their manufacturing work, which is truly the backbone of our community, and limiting good-paying jobs in our community. My district is home to innovative manufacturing work, including electric vehicles and components, but we cannot make America the leader in these emerging technologies if we cannot ensure American leadership in microelectronics and chips.

That's why I am so glad to support this Committee's work today with the *Microelectronics Research for Energy Innovation Act* and to offer my amendment that will enhance the bill and our country's competitive advantage in microelectronics. Specifically, my amendment expands the research topics this bill will authorize to improve the lifetime maintenance, decommissioning, recycling, reuse, and sustainability of microelectronics components and systems.

Microelectronics fabrication is a resource-intensive process. It uses a significant amount of water, energy, and critical materials, and advancing science that saves or reuses resources is a win for chipmakers and every industry that relies on their technology. Furthering this field of research will help advance the global competitiveness of the American microelectronics sector and insulate the industry from shocks to the global supply chain. I urge support for my amendment, and I yield back.

Mr. PERLMUTTER. The gentlelady from Pennsylvania yields back.

Is there any further discussion on her amendment?

Seeing none, the vote occurs on Ms. Wild's amendment.

All in favor, please say aye.

Those opposed, please say no.

In the opinion of the Chair, the ayes have it, and the amendment is agreed to.

A final amendment on the roster is the amendment of the gentleman from Florida, Mr. Gimenez. For what purpose does the gentleman seek to be recognized?

Mr. GIMENEZ. Mr. Chairman, I have an amendment at the desk.

Chairwoman JOHNSON. The Clerk will report the title.

The CLERK. Amendment No. 4, amendment to H.R. 6291 offered by Mr. Gimenez of Florida.

[The amendment of Mr. Gimenez follows:]

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AMENDMENT TO H.R. 6291
OFFERED BY MR. GIMENEZ OF FLORIDA

Page 6, line 18, after “Transitions”, insert “, and in consultation with the private sector,”.

Page 6, line 19, after “technologies”, insert “and identify emerging research and development needs of industry and government”.



Mr. PERLMUTTER. Without objection, the reading of the amendment is dispensed with.

Mr. Gimenez, you're recognized for 5 minutes to describe your amendment.

Mr. GIMENEZ. Thank you, Mr. Chairman.

This amendment requires the Department of Energy to consult with the private sector as part of its efforts to support translational microelectronics research and the transfer of microelectronics technologies developed as part of the microelectronics research program authorized by this bill. It also directs the Department to identify the latest needs of industry and government in order to best focus its research and development efforts.

Our domestic producers of microelectronics and of the myriad of critical products that contain them must have access to the most cutting-edge technologies in order to compete internationally. We must ensure that our Federal research and development programs effectively and efficiently usher new technologies to the marketplace in order to get the greatest return of our investment for these programs. The Department needs the unique perspective of our private sector in order to identify gaps in existing research and pinpoint the challenges that pose the greatest barriers to success in the international marketplace. My amendment will assure the Department actively engages with these eventual users of the technologies developed through this program in order to maximize its value.

Our domestic microelectronics industry is a tremendous resource for the Department. My home State of Florida has embraced this thriving industry. According to the Semiconductor Industry Association, Florida ranks 5th in the United States for total number of semiconductor jobs. Additionally, our Governor has announced additional support to increase microchip and semiconductor manufacturing in Florida.

Our private sector is ready to serve as a critical partner for the Department of Energy and other Federal agencies to accomplish this shared goal of increasing international competitiveness. I urge my colleagues to support this amendment, and I yield back. Thank you, Mr. Chairman.

Mr. PERLMUTTER. The gentleman yields back.

Is there anybody else who would like to comment on Mr. Gimenez's amendment?

I do, so I'll recognize myself to speak on his amendment.

I want to thank the gentleman for his amendment. This amendment would require the Department of Energy to consult with the private sector in carrying out technology transfer activities under the microelectronics research program authorized in the *Micro Act*. Strengthening communication and coordination between the Department and its industry partners will help to streamline the transition of research into commercially viable products. Such an effort is critical for maintaining and enhancing the competitiveness of the domestic microelectronics sector.

With that, I will yield back and urge my colleagues to support Mr. Gimenez's amendment.

Is there any other discussion?

Seeing none, the question now is on Mr. Gimenez's amendment.

All those in favor, please say aye.

Those opposed, say no.

In the opinion of the Chair, the ayes have it, and the amendment is agreed to.

Are there any other amendments, any other discussion?

Seeing none, a reporting quorum being present, I move that the Committee on Science, Space, and Technology report H.R. 6291, as amended, to the House with the recommendation that the bill be approved.

Those in favor of the motion will signify by saying aye.

All those opposed, say no.

In the opinion of the Chair, the ayes have it, and the bill is favorably reported.

And without objection, the motion to reconsider is laid upon the table, and I ask unanimous consent that staff be authorized to make any necessary technical and conforming changes to the bill. And without objection, it is so ordered.

Members will have 2 subsequent calendar days in which to submit supplemental, minority, or additional views on this measure.

And with that, I want to thank the Committee for its attendance and attention today. And this concludes our markup. Adios, everybody.

Mr. CASTEN. Happy trails.

[Whereupon, at 12:07 p.m., the Committee was adjourned.]

