

BIOECONOMY RESEARCH AND DEVELOPMENT ACT OF
2021

JANUARY 28, 2022.—Ordered to be printed

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

R E P O R T

[To accompany H.R. 4521]

The Committee on Science, Space, and Technology, to whom was referred the bill (H.R. 4521) to provide for a coordinated Federal research initiative to ensure continued United States leadership in engineering biology, having considered the same, reports favorably thereon with an amendment and recommends that the bill as amended do pass.

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I. AMENDMENT

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 “Bioeconomy Research and Development Act of 2021”.

SEC. 2. FINDINGS.

The Congress makes the following findings:

(1) Cellular and molecular processes may be used, mimicked, or redesigned to develop new products, processes, and systems that improve societal well-being, strengthen national security, and contribute to the economy.

(2) Engineering biology relies on a workforce with a diverse and unique set of skills combining the biological, physical, chemical, and information sciences and engineering.

(3) Long-term research and development is necessary to create breakthroughs in engineering biology. Such research and development requires government investment as many of the benefits are too distant or uncertain for industry to support alone.

(4) Research is necessary to inform evidence-based governance of engineering biology and to support the growth of the engineering biology industry.

(5) The Federal Government has an obligation to ensure that ethical, legal, environmental, safety, security, and societal implications of its science and technology research and investment follows policies of responsible innovation and fosters public transparency.

(6) The Federal Government can play an important role by facilitating the development of tools and technologies to further advance engineering biology, including user facilities, by facilitating public-private partnerships, by supporting risk research, and by facilitating the commercial application in the United States of research funded by the Federal Government.

(7) The United States led the development of the science and engineering techniques that created the field of engineering biology, but due to increasing international competition, the United States is at risk of losing its competitive advantage if it does not strategically invest the necessary resources.

(8) A National Engineering Biology Initiative can serve to establish new research directions and technology goals, improve interagency coordination and planning processes, drive technology transfer to the private sector, and help ensure optimal returns on the Federal investment.

SEC. 3. DEFINITIONS.

In this Act:

(1) **BIOMANUFACTURING.**—The term “biomanufacturing” means the utilization of biological systems to develop new and advance existing products, tools, and processes at commercial scale.

(2) **ENGINEERING BIOLOGY.**—The term “engineering biology” means the application of engineering design principles and practices to biological systems, including molecular and cellular systems, to advance fundamental understanding of complex natural systems and to enable novel or optimize functions and capabilities.

(3) **INITIATIVE.**—The term “Initiative” means the National Engineering Biology Research and Development Initiative established under section 4.

(4) **OMICS.**—The term “omics” refers to the collective technologies used to explore the roles, relationships, and actions of the various types of molecules that make up the cells of an organism.

SEC. 4. NATIONAL ENGINEERING BIOLOGY RESEARCH AND DEVELOPMENT INITIATIVE.

(a) **IN GENERAL.**—The President, acting through the Office of Science and Technology Policy, shall implement a National Engineering Biology Research and Development Initiative to advance societal well-being, national security, sustainability, and economic productivity and competitiveness through—

(1) advancing areas of research at the intersection of the biological, physical, chemical, data, and computational and information sciences and engineering to accelerate scientific understanding and technological innovation in engineering biology;

(2) advancing areas of biomanufacturing research to optimize, standardize, scale, and deliver new products and solutions;

(3) supporting social and behavioral sciences and economics research that advances the field of engineering biology and contributes to the development and public understanding of new products, processes, and technologies;

(4) improving the understanding of engineering biology of the scientific and lay public and supporting greater evidence-based public discourse about its benefits and risks;

- (5) supporting research relating to the risks and benefits of engineering biology, including under subsection (d);
 - (6) supporting the development of novel tools and technologies to accelerate scientific understanding and technological innovation in engineering biology;
 - (7) expanding the number of researchers, educators, and students and a retooled workforce with engineering biology training, including from traditionally underrepresented and underserved populations;
 - (8) accelerating the translation and commercialization of engineering biology and biomanufacturing research and development by the private sector; and
 - (9) improving the interagency planning and coordination of Federal Government activities related to engineering biology.
- (b) INITIATIVE ACTIVITIES.—The activities of the Initiative shall include—
- (1) sustained support for engineering biology research and development through—
 - (A) grants to fund the work of individual investigators and teams of investigators, including interdisciplinary teams;
 - (B) projects funded under joint solicitations by a collaboration of no fewer than two agencies participating in the Initiative; and
 - (C) interdisciplinary research centers that are organized to investigate basic research questions, carry out technology development and demonstration activities, and increase understanding of how to scale up engineering biology processes, including biomanufacturing;
 - (2) sustained support for databases and related tools, including—
 - (A) support for the establishment, curation, and maintenance of curated genomics, epigenomics, and other relevant omics databases, including plant, animal, and microbial databases, that are available to researchers to carry out engineering biology research in a manner that does not compromise national security or the privacy or security of information within such databases;
 - (B) development of standards for such databases, including for curation, interoperability, and protection of privacy and security;
 - (C) support for the development of computational tools, including artificial intelligence tools, that can accelerate research and innovation using such databases; and
 - (D) an inventory and assessment of all Federal government omics databases to identify opportunities to improve the utility of such databases, as appropriate and in a manner that does not compromise national security or the privacy and security of information within such databases, and inform investment in such databases as critical infrastructure for the engineering biology research enterprise;
 - (3) sustained support for the development, optimization, and validation of novel tools and technologies to enable the dynamic study of molecular processes in situ, including through—
 - (A) research conducted at Federal laboratories;
 - (B) grants to fund the work of investigators at institutions of higher education and other nonprofit research institutions;
 - (C) incentivized development of retooled industrial sites across the country that foster a pivot to modernized engineering biology initiatives; and
 - (D) awards under the Small Business Innovation Research Program and the Small Business Technology Transfer Program, as described in section 9 of the Small Business Act (15 U.S.C. 638);
 - (4) support for education and training of undergraduate and graduate students in engineering biology, biomanufacturing, bioprocess engineering, and computational science applied to engineering biology and in the related ethical, legal, environmental, safety, security, and other societal domains;
 - (5) support for biomanufacturing testbeds, including by repurposing existing facilities such as those in paragraph 3(C), that would enable scale up of laboratory engineering biology research;
 - (6) activities to develop robust mechanisms for documenting and quantifying the outputs and economic benefits of engineering biology; and
 - (7) activities to accelerate the translation and commercialization of new products, processes, and technologies by—
 - (A) identifying precompetitive research opportunities;
 - (B) facilitating public-private partnerships in engineering biology research and development, including to address barriers to scaling up innovations in engineering biology;
 - (C) connecting researchers, graduate students, and postdoctoral fellows with entrepreneurship education and training opportunities; and

(D) supporting proof of concept activities and the formation of startup companies including through programs such as the Small Business Innovation Research Program and the Small Business Technology Transfer Program.

(c) EXPANDING PARTICIPATION.—The Initiative shall include, to the maximum extent practicable, outreach to primarily undergraduate and minority-serving institutions about Initiative opportunities, and shall encourage the development of research collaborations between research-intensive universities and primarily undergraduate and minority-serving institutions.

(d) ETHICAL, LEGAL, ENVIRONMENTAL, SAFETY, SECURITY, AND SOCIETAL ISSUES.—Initiative activities shall take into account ethical, legal, environmental, safety, security, and other appropriate societal issues by—

(1) supporting research, including in the social sciences, and other activities addressing ethical, legal, environmental, and other appropriate societal issues related to engineering biology, including integrating research on such topics with the research and development in engineering biology, and encouraging the dissemination of the results of such research, including through interdisciplinary engineering biology research centers described in subsection (b)(1);

(2) supporting research and other activities related to the safety and security implications of engineering biology, including outreach to increase awareness among Federal researchers and Federally-funded researchers at institutions of higher education about potential safety and security implications of engineering biology research, as appropriate;

(3) ensuring that input from Federal and non-Federal experts on the ethical, legal, environmental, safety, security, and other appropriate societal issues related to engineering biology is integrated into the Initiative;

(4) ensuring, through the agencies and departments that participate in the Initiative, that public input and outreach are integrated into the Initiative by the convening of regular and ongoing public discussions through mechanisms such as workshops, consensus conferences, and educational events, as appropriate; and

(5) complying with all applicable provisions of Federal law.

SEC. 5. INITIATIVE COORDINATION.

(a) INTERAGENCY COMMITTEE.—The President, acting through the Office of Science and Technology Policy, shall designate an interagency committee to coordinate activities of the Initiative as appropriate, which shall be co-chaired by the Office of Science and Technology Policy, and include representatives from the National Science Foundation, the Department of Energy, the National Aeronautics and Space Administration, the National Institute of Standards and Technology, the Environmental Protection Agency, the National Oceanic and Atmospheric Administration, the Department of Agriculture, the Department of Health and Human Services, the Bureau of Economic Analysis, and any other agency that the President considers appropriate (in this section referred to as the “Interagency Committee”). The Director of the Office of Science and Technology Policy shall select an additional co-chairperson from among the members of the Interagency Committee. The Interagency Committee shall oversee the planning, management, and coordination of the Initiative. The Interagency Committee shall—

(1) provide for interagency coordination of Federal engineering biology research, development, and other activities undertaken pursuant to the Initiative;

(2) establish and periodically update goals and priorities for the Initiative;

(3) develop, not later than 12 months after the date of the enactment of this Act, and update every 3 years thereafter, a strategic plan submitted to the Committee on Science, Space, and Technology and the Committee on Energy and Commerce of the House of Representatives and the Committee on Commerce, Science, and Transportation and the Committee on Health, Education, Labor, and Pensions of the Senate that—

(A) guides the activities of the Initiative for purposes of meeting the goals and priorities established under (and updated pursuant to) paragraph (2); and

(B) describes—

(i) the Initiative’s support for long-term funding for interdisciplinary engineering biology research and development;

(ii) the Initiative’s support for education and public outreach activities;

(iii) the Initiative’s support for research and other activities on ethical, legal, environmental, safety, security, and other appropriate societal issues related to engineering biology including—

(I) an applied biorisk management research plan;

(II) recommendations for integrating security into biological data access and international reciprocity agreements;

(III) recommendations for manufacturing restructuring to support engineering biology research, development, and scaling-up initiatives; and

(IV) an evaluation of existing biosecurity governance policies, guidance, and directives for the purposes of creating an adaptable, evidence-based framework to respond to emerging biosecurity challenges created by advances in engineering biology;

(iv) how the Initiative will contribute to moving results out of the laboratory and into application for the benefit of society and United States competitiveness; and

(v) how the Initiative will measure and track the contributions of engineering biology to United States economic growth and other societal indicators;

(4) develop a national genomic sequencing strategy to ensure engineering biology research fully leverages plant, animal, and microbe biodiversity, as appropriate and in a manner that does not compromise national security or the privacy or security of human genetic information, to enhance long-term innovation and competitiveness in engineering biology in the United States;

(5) develop a plan to utilize Federal programs, such as the Small Business Innovation Research Program and the Small Business Technology Transfer Program as described in section 9 of the Small Business Act (15 U.S.C. 638), in support of the activities described in section 4(b)(3); and

(6) in carrying out this section, take into consideration the recommendations of the advisory committee established under section 6, the results of the workshop convened under section 7, existing reports on related topics, and the views of academic, State, industry, and other appropriate groups.

(b) TRIENNIAL REPORT.—Beginning with fiscal year 2022 and ending in fiscal year 2028, not later than 90 days after submission of the President's annual budget request and every third fiscal year thereafter, the Interagency Committee shall prepare and submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report that includes—

(1) a summarized agency budget in support of the Initiative for the fiscal year to which such budget request applies, for the following 2 fiscal years, for the then current fiscal year, including a breakout of spending for each agency participating in the Program, and for the development and acquisition of any research facilities and instrumentation; and

(2) an assessment of how Federal agencies are implementing the plan described in subsection (a)(3), including—

(A) a description of the amount and number of awards made under the Small Business Innovation Research Program and the Small Business Technology Transfer Program (as described in section 9 of the Small Business Act (15 U.S.C. 638)) in support of the Initiative;

(B) a description of the amount and number of projects funded under joint solicitations by a collaboration of no fewer than 2 agencies participating in the Initiative; and

(C) a description of the effect of the newly funded projects by the Initiative.

(c) INITIATIVE OFFICE.—

(1) IN GENERAL.—The President shall establish an Initiative Coordination Office, with a Director and full-time staff, which shall—

(A) provide technical and administrative support to the interagency committee and the advisory committee established under section 6;

(B) serve as the point of contact on Federal engineering biology activities for government organizations, academia, industry, professional societies, State governments, interested citizen groups, and others to exchange technical and programmatic information;

(C) oversee interagency coordination of the Initiative, including by encouraging and supporting joint agency solicitation and selection of applications for funding of activities under the Initiative, as appropriate;

(D) conduct public outreach, including dissemination of findings and recommendations of the advisory committee established under section 6, as appropriate;

(E) serve as the coordinator of ethical, legal, environmental, safety, security, and other appropriate societal input; and

(F) promote access to, and early application of, the technologies, innovations, and expertise derived from Initiative activities to agency missions

and systems across the Federal Government, and to United States industry, including startup companies.

(2) **FUNDING.**—The Director of the Office of Science and Technology Policy, in coordination with each participating Federal department and agency, as appropriate, shall develop and annually update an estimate of the funds necessary to carry out the activities of the Initiative Coordination Office and submit such estimate with an agreed summary of contributions from each agency to Congress as part of the President's annual budget request to Congress.

(3) **TERMINATION.**—The Initiative Coordination Office established under this subsection shall terminate on the date that is 10 years after the date of the enactment of this Act.

(d) **RULE OF CONSTRUCTION.**—Nothing in this section shall be construed to alter the policies, processes, or practices of individual Federal agencies in effect on the day before the date of the enactment of this Act relating to the conduct of biomedical research and advanced development, including the solicitation and review of extramural research proposals.

SEC. 6. ADVISORY COMMITTEE.

(a) **IN GENERAL.**—The agency co-chair of the interagency committee established in section 5 shall, in consultation with the Office of Science and Technology Policy, designate or establish an advisory committee on engineering biology research and development (in this section referred to as the “advisory committee”) to be composed of not fewer than 12 members, including representatives of research and academic institutions, industry, and nongovernmental entities, who are qualified to provide advice on the Initiative.

(b) **ASSESSMENT.**—The advisory committee shall assess—

(1) the current state of United States competitiveness in engineering biology, including the scope and scale of United States investments in engineering biology research and development in the international context;

(2) current market barriers to commercialization of engineering biology products, processes, and tools in the United States;

(3) progress made in implementing the Initiative;

(4) the need to revise the Initiative;

(5) the balance of activities and funding across the Initiative;

(6) whether the strategic plan developed or updated by the interagency committee established under section 5 is helping to maintain United States leadership in engineering biology;

(7) the management, coordination, implementation, and activities of the Initiative; and

(8) whether ethical, legal, environmental, safety, security, and other appropriate societal issues are adequately addressed by the Initiative.

(c) **REPORTS.**—Beginning not later than 2 years after the date of enactment of this Act, and not less frequently than once every 3 years thereafter, the advisory committee shall submit to the President, the Committee on Science, Space, and Technology of the House of Representatives, and the Committee on Commerce, Science, and Transportation of the Senate, a report on—

(1) the findings of the advisory committee's assessment under subsection (b);

and

(2) the advisory committee's recommendations for ways to improve the Initiative.

(d) **APPLICATION OF FEDERAL ADVISORY COMMITTEE ACT.**—Section 14 of the Federal Advisory Committee Act (5 U.S.C. App.) shall not apply to the Advisory Committee.

(e) **TERMINATION.**—The advisory committee established under subsection (a) shall terminate on the date that is 10 years after the date of the enactment of this Act.

SEC. 7. EXTERNAL REVIEW OF ETHICAL, LEGAL, ENVIRONMENTAL, SAFETY, SECURITY, AND SOCIETAL ISSUES.

(a) **IN GENERAL.**—Not later than 6 months after the date of enactment of this Act, the Director of the National Science Foundation shall seek to enter into an agreement with the National Academies of Sciences, Engineering, and Medicine to conduct a review, and make recommendations with respect to, the ethical, legal, environmental, safety, security, and other appropriate societal issues related to engineering biology research and development. The review shall include—

(1) an assessment of the current research on such issues;

(2) a description of the research gaps relating to such issues;

(3) recommendations on how the Initiative can address the research needs identified pursuant to paragraph (2); and

(4) recommendations on how researchers engaged in engineering biology can best incorporate considerations of ethical, legal, environmental, safety, security,

and other societal issues into the development of research proposals and the conduct of research.

(b) **REPORT TO CONGRESS.**—The agreement entered into under subsection (a) shall require the National Academies of Sciences, Engineering, and Medicine to, not later than 2 years after the date of the enactment of this Act—

(1) submit to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report containing the findings and recommendations of the review conducted under subsection (a); and

(2) make a copy of such report available on a publicly accessible website.

SEC. 8. AGENCY ACTIVITIES.

(a) **NATIONAL SCIENCE FOUNDATION.**—As part of the Initiative, the National Science Foundation shall—

(1) support research in engineering biology and biomanufacturing through individual grants, collaborative grants, and through interdisciplinary research centers;

(2) support research on the environmental, legal, ethical, and social implications of engineering biology;

(3) provide support for research instrumentation, equipment, and cyberinfrastructure for engineering biology disciplines, including support for research, development, optimization and validation of novel technologies to enable the dynamic study of molecular processes in situ;

(4) support curriculum development and research experiences for secondary, undergraduate, and graduate students in engineering biology and biomanufacturing, including through support for graduate fellowships and traineeships in engineering biology; and

(5) award grants, on a competitive basis, to enable institutions to support graduate students and postdoctoral fellows who perform some of their engineering biology research in an industry setting.

(b) **DEPARTMENT OF COMMERCE.**—

(1) **NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY.**—As part of the Initiative, the Director of the National Institute of Standards and Technology shall—

(A) establish a bioscience research program to advance the development of standard reference materials and measurements and to create new data tools, techniques, and processes necessary to advance engineering biology and biomanufacturing;

(B) provide access to user facilities with advanced or unique equipment, services, materials, and other resources to industry, institutions of higher education, nonprofit organizations, and government agencies to perform research and testing; and

(C) provide technical expertise to inform the potential development of guidelines or safeguards for new products, processes, and systems of engineering biology.

(2) **NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION.**—As part of the initiative, the Administrator of the National Oceanic and Atmospheric Administration shall—

(A) conduct and support research in omics and associated bioinformatic sciences and develop tools and products to improve ecosystem stewardship, monitoring, management, assessments and forecasts, consistent with the mission of the agency; and

(B) collaborate with other agencies to understand potential environmental threats and safeguards related to engineering biology.

(c) **DEPARTMENT OF ENERGY.**—As part of the Initiative, the Secretary of Energy shall—

(1) conduct and support research, development, demonstration, and commercial application activities in engineering biology, including in the areas of synthetic biology, advanced biofuel and bioproduct development, biobased materials, and environmental remediation;

(2) support the development, optimization and validation of novel, scalable tools and technologies to enable the dynamic study of molecular processes in situ;

(3) provide access to user facilities with advanced or unique equipment, services, materials, and other resources, including secure access to high-performance computing, as appropriate, to industry, institutions of higher education, nonprofit organizations, and government agencies to perform research and testing; and

- (4) strengthen collaboration between the Office of Science and the Energy Efficiency and Renewable Energy Office to help transfer fundamental research results to industry and accelerate commercial applications.
- (d) NATIONAL AERONAUTICS AND SPACE ADMINISTRATION.—As part of the Initiative, the National Aeronautics and Space Administration shall—
 - (1) conduct and support research in engineering biology, including in synthetic biology, and related to Earth and space sciences, aeronautics, space technology, and space exploration and experimentation, consistent with the priorities established in the National Academies’ decadal surveys; and
 - (2) award grants, on a competitive basis, that enable institutions to support graduate students and postdoctoral fellows who perform some of their engineering biology research in an industry setting.
- (e) DEPARTMENT OF AGRICULTURE.—As part of the Initiative, the Secretary of Agriculture shall—
 - (1) support research and development in engineering biology, including in synthetic biology and biomaterials;
 - (2) award grants through the National Institute of Food and Agriculture and the Agriculture Advanced Research and Development Authority; and
 - (3) support development conducted by the Agricultural Research Service.
- (f) ENVIRONMENTAL PROTECTION AGENCY.—As part of the Initiative, the Environmental Protection Agency shall support research on how products, processes, and systems of engineering biology will affect or can protect the environment.
- (g) DEPARTMENT OF HEALTH AND HUMAN SERVICES.—As part of the Initiative, the Secretary of Health and Human Services, as appropriate and consistent with activities of the Department of Health and Human Services in effect on the day before the date of the enactment of this Act, shall—
 - (1) support research and development to advance the understanding and application of engineering biology for human health;
 - (2) support relevant interdisciplinary research and coordination; and
 - (3) support activities necessary to facilitate oversight of relevant emerging biotechnologies.

SEC. 9. RULE OF CONSTRUCTION.

Nothing in this Act shall be construed to require public disclosure of information that is exempt from mandatory disclosure under section 552 of title 5, United States Code.

II. PURPOSE OF THE BILL

The purpose of the bill is to provide for a coordinated Federal research initiative to ensure continued United States leadership in engineering biology and biomanufacturing.

III. BACKGROUND AND NEED FOR THE LEGISLATION

Engineering biology is a multidisciplinary field at the interface of biological, physical, chemical, and information sciences and engineering. By applying tools from engineering, computing, and physical sciences to biological systems, researchers are able to study, mimic and design new biological systems to develop or improve existing products, processes, and systems. The applications to energy, agriculture, and advanced manufacturing are vast, and many such applications are already in the commercial marketplace. Researchers are also excited about the potential benefits to human and environmental health. Since engineering biology will allow researchers to create biological systems that do not occur naturally and to re-engineer existing biological systems to perform novel tasks, there are also myriad ethical, legal, environmental, and societal issues to be considered. The U.S. will be well-positioned to help lead the world in ensuring the responsible development of biotechnologies, but only if it is also leading in the marketplace.

Due to the lack of an agreed upon definition for this field as well as a lack of federal strategy, it is difficult to get a figure for federal investment in engineering biology or the total economy impact.

GAO produced a report in 2018 at the request of the Science, Space, and Technology Committee that included some information about federal investments in synthetic biology, a significant subset of engineering biology, but was incomplete in that regard. They found that 10 agencies support synthetic biology research, and 6 of those 10 agencies reported a combined total of at least \$211.2 million in support of synthetic biology research in FY 2017. One study of the economic impact in the U.S. estimated that the bioeconomy was already responsible for 5 percent of U.S. GDP in 2016.

Other nations are making significant progress in engineering biology. China in particular has made it a priority to be the global leader in engineering biology and is investing accordingly. In 2018, a Chinese official publicly reported that the bioeconomy in China is growing at 15% annually and in 2015 generated \$700 billion, or ~4% of GDP, with a government target to more than double this to \$1.6 trillion by 2020. The European Union has also long prioritized engineering biology research, releasing its first Bioeconomy strategy in 2012.

While prior administrations took steps toward the creation of a national bioeconomy initiative with a focus on Federal investments in engineering biology R&D, there remains no formal mechanism for a coordinated federal government approach to investments in this field or to partnership with the private sector. H.R. 4521 creates the foundation for U.S. leadership in the bioeconomy while also ensuring that the U.S. is positioned to lead global discussions about safety, security, ethics, and other governance issues related to engineering biology. The first version of this legislation was introduced in 2015, and ever since then, the Committee has been holding formal and informal discussions on the legislation and updating it regularly to reflect the rapidly changing state of research and innovation in engineering biology.

IV. COMMITTEE HEARINGS

Pursuant to clause 3(c)(6) of rule XIII, the Committee, on April 15, 2021, held a hearing entitled, “Reimagining Our Innovation Future.” The purpose of the hearing was to examine the current outlook for U.S. leadership in science and technology and discuss how new investments and new models of partnership in science and technology can be leveraged to ensure continued leadership and address economic, security, environmental, public health, and other societal challenges from the local to the global level. The Committee heard testimony from four witnesses: Mr. Norm Augustine; Dr. Frances H. Arnold, Linus Pauling Professor of Chemical Engineering, Bioengineering and Biochemistry, California Institute of Technology; The Honorable Ernest J. Moniz, President and Chief Executive Officer, Energy Futures Initiative, and Former Secretary, U.S. Department of Energy; and Dr. Farnam Jahanian, President, Carnegie Mellon University.

On March 12, 2019, the Subcommittee on Research and Technology of the Committee on Science, Space, and Technology held a hearing to review the opportunities and challenges with new and emerging bioscience and biotechnologies with application in agriculture, energy, and manufacturing; to examine the role of the federal government in research and development (R&D) and oversight of such science and technologies; and to examine the status of U.S.

leadership in engineering biology. An additional purpose of this hearing was to receive testimony on the *Engineering Biology Research and Development Act*. The Subcommittee heard testimony from five witnesses: Dr. Rob Carlson, Managing Director of Bioeconomy Capital; Dr. Kevin Solomon, Assistant Professor of Agricultural & Biological Engineering at Purdue University; Dr. Eric Hegg, Professor of Biochemistry and Molecular Biology, Michigan State University and Michigan State University Subcontract Lead, Great Lakes Bioenergy Research Center; Dr. Sean Simpson, Chief Scientific Officer and Co-Founder of LanzaTech; and Dr. Laurie Zoloth, Margaret E. Burton Professor of Religion and Ethics, and Senior Advisor to the Provost for Programs in Social Ethics at the University of Chicago.

V. COMMITTEE CONSIDERATION AND VOTES

On July 19, 2021, Chairwoman Eddie Bernice Johnson, joined by Ranking Member Frank Lucas, introduced H.R. 4521, the *Bioeconomy Research and Development Act of 2021*. The bill was referred to the House Committee on Science, Space, and Technology, in addition to the Committee on Agriculture and the Committee on Energy and Commerce.

On January 19, 2022, the Committee on Science, Space, and Technology met to consider H.R. 4521. Mr. Feenstra offered an amendment to include biomanufacturing in NSF activities and animal databases in initiative activities. *The amendment was agreed to on a voice vote*. Mr. Lucas offered an amendment to add support for biomanufacturing testbeds to enhance scale-up research activity under the initiative. *The amendment was agreed to on a voice vote*. Ms. Johnson moved that the Committee favorably report the bill, H.R. 4521, to the House 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. 4521 would establish a federal engineering biology and biomanufacturing research initiative and require a national strategy for federal agency investments and a framework for interagency coordination. The legislation would also expand public-private partnerships and expand education and training for the next generation of engineering biology researchers. Further, it provides direction for mission-relevant activities in engineering biology and biomanufacturing for several agencies, including the National Science Foundation, the Department of Energy, the National Institute of Standards and Technology, the National Oceanic and Atmospheric Administration, the Environmental Protection Agency, the National Aeronautics and Space Administration, the U.S. Department of Agriculture, and the National Institutes of Health. Finally, the legislation ensures that the authorized Initiative would address potential ethical, legal, environmental, safety and security issues associated with engineering biology research.

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

Section 1. Short title

Bioeconomy Research and Development Act of 2021.

Section 2. Findings

Highlights the importance of engineering biology to societal well-being, national security, and the economy, and how the federal government can play an important role in maintaining U.S. leadership in engineering biology research and development.

Section 3. Definitions

Defines terms used in the bill.

Section 4. National Engineering Biology Research and Development Initiative

Subsection (a) establishes a National Engineering Biology Research and Development Initiative to advance engineering biology research; support risk research to address ethical, safety, security and other societal implications of engineering biology; support the development of tools to accelerate engineering biology research; expand the number of engineering biology researchers; accelerate the translation and commercialization of engineering biology research; and improve interagency planning and coordination of federal engineering biology research initiatives.

Subsection (b) describes the specific activities of the Initiative, including support for research grants, research centers, “omics” databases, novel tools and technologies to accelerate research, education and training of students, metrics to understand and assess the bioeconomy, and technology transfer activities.

Subsection (c) requires outreach to minority-serving institutions and predominantly undergraduate institutions and encourages research collaborations among different types of institutions.

Subsection (d) describes how the Initiative should take into account the ethical, legal, environmental, safety, security, and other appropriate societal concerns.

Sec. 5. Initiative Coordination

Requires OSTP to designate an Interagency Committee that would oversee the planning, management, and coordination of the Initiative, in addition to developing and regularly updating a strategic plan for the Initiative, developing a national genomic sequencing strategy; and submitting to Congress an annual coordinated interagency budget proposal for the Initiative.

Section 6. Advisory Committee

Designates an Advisory Committee of non-Federal members to provide advice on the Initiative (in practice the intent would be for PCAST to fill this role); charges the Committee with specific duties; and requires the Committee to report on their findings and recommendations at least every 3 years.

Section 7. External review of ethical, environmental, and societal concerns.

Requires a National Academy of Sciences workshop to review the ethical, environmental, societal, and health concerns related to engineering biology research and development.

Section 8. Agency functions

Describes specific Initiative activities and responsibilities for the National Science Foundation, the Department of Energy, the National Institute of Standards and Technology, the National Oceanic and Atmospheric Administration, the Environmental Protection Agency, the National Aeronautics and Space Administration, the U.S. Department of Agriculture, and the National Institutes of Health.

VIII. COMMITTEE VIEWS

It is the intent of the Committee that the Director of the Office of Science and Technology Policy collaborate and coordinate with security and intelligence agencies as needed to address any emerging security concerns with respect to engineering biology. This may include appointing representatives of such agencies to the inter-agency committee required under Section 5. Similarly, the Committee believes that more data and analyses of the bioeconomy will be an important tool in informing both the Federal research agenda and private sector investments. As such, we encourage the Department of Commerce's Bureau of Economic Analysis to participate in the Initiative IWG and to develop and publish new metrics for the bioeconomy.

Further, it is the intent of the Committee that the OSTP Director appoint such staff as are necessary to carry out all of the responsibilities described in Section 5(c), including through the recruitment of additional agency detailees with relevant expertise.

Section 7 requires a National Academies review of ethical, legal, environmental and other societal implications of engineering biology research and development. While the Committee has great respect for the Academies and its established process for appointing study committees, we encourage the Academies staff to cast a sufficiently broad net in seeking experts from both academia and the private-sector to reflect the diversity that exists within engineering biology, including the diversity in potential products, economic sectors, technology areas, and research directions.

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

Congressional Budget Office Cost Estimate Report is pending.

XI. FEDERAL MANDATES STATEMENT

H.R. 4521 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

The *Bioeconomy Research and Development Act of 2021* would establish a federal engineering biology research initiative to ensure U.S. leadership in engineering biology. It would also establish a framework for greater coordination of federal investments in engineering biology; lead to a national strategy for those investments; expand public-private partnerships; focus on the education and training for the next generation of engineering biology researchers; and address any potential ethical, legal, environmental, safety and security issues associated with engineering biology research.

XIV. FEDERAL ADVISORY COMMITTEE STATEMENT

H.R. 4521 creates an advisory committee but permits the President to carry out this requirement by enlarging the mandate of another existing advisory committee.

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. 4521 establishes or reauthorizes a program of the federal government 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 clause 9(e), 9(f), and 9(g) of rule XXI, the Committee finds that H.R. 4521 contains no earmarks, limited tax benefits, or limited tariff benefits.

XVII. APPLICABILITY TO THE LEGISLATIVE BRANCH

The Committee finds that H.R. 4521 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. EXCHANGE OF COMMITTEE CORRESPONDENCE

DAVID SCOTT, GEORGIA
CHAIRMANJIM COSTA, CALIFORNIA
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CYNTHIA ADAMS, IOWA
KIM SCHRIER, WASHINGTON
JIMMY PANETTA, CALIFORNIA
SANFORD D. BISHOP, JR., GEORGIAU.S. House of Representatives
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RANKING MINORITY MEMBERAUSTIN SCOTT, GEORGIA
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STAFF DIRECTOR
PARISH BRADEN,
MINORITY STAFF DIRECTOR

January 26, 2022

The Honorable Eddie Bernice Johnson
Chairwoman, Committee on Science, Space, and Technology
U.S. House of Representatives
2321 Rayburn House Office Building
Washington, D.C. 20515

Dear Chairwoman Johnson:

This letter confirms our mutual understanding regarding H.R. 4521, the *Bioeconomy Research and Development Act of 2021*. Thank you for collaborating with the Committee on Agriculture on the matters within our jurisdiction.

The Committee on Agriculture will forego any further consideration of this bill so that it may proceed expeditiously to the House floor for consideration. However, by foregoing consideration at this time, we do not waive any jurisdiction over any subject matter contained in this or similar legislation. We request our Committees continue to work together on changes to this bill that are within the jurisdiction of the Committee on Agriculture and that we be consulted and involved as this bill moves forward so that we may address any remaining issues in our jurisdiction. The Committee on Agriculture also reserves the right to seek appointment of any appropriate number of conferees to any House-Senate conference involving this or similar legislation and ask that you support any such request.

We would appreciate a response to this letter confirming this understanding with respect to H.R. 4521 and request that a copy of our letters on this matter be published in the Congressional Record during Floor consideration.

Sincerely,

David Scott
Chairmancc: The Honorable Glenn Thompson, Ranking Member
The Honorable Frank Lucas, Ranking Member
The Honorable Nancy Pelosi, Speaker
The Honorable Jason Smith, Parliamentarian

EDDIE BERNICE JOHNSON, Texas
CHAIRWOMAN

FRANK D. LUCAS, Oklahoma
RANKING MEMBER

Congress of the United States
House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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January 27, 2022

The Honorable David Scott
Chairman
Committee on Agriculture
1301 Longworth House Office Building
Washington, DC 20515

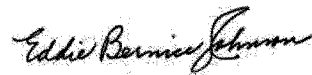
Dear Chairman Scott,

I am writing to you concerning H.R. 4521, the "Bioeconomy Research and Development Act of 2021," which was referred to the Committee on Science, Space, and Technology on July 19, 2021.

I appreciate your willingness to work cooperatively on this bill. I recognize that the bill contains provisions that fall within the jurisdiction of the Committee on Agriculture. I acknowledge that your Committee will waive further consideration of H.R. 4521 and that this action is not a waiver of future jurisdictional claims by the Committee on Agriculture over this subject matter.

I will make sure to include our exchange of letters in the *Congressional Record* and will support the appointment of the Committee on Agriculture conferees during any House-Senate conference. Thank you for your cooperation on this legislation.

Sincerely,



Eddie Bernice Johnson
Chairwoman
Committee on Science, Space, and Technology

cc: Ranking Member Frank D. Lucas, Committee on Science, Space, and Technology
Ranking Member Glenn Thompson, Committee on Agriculture
The Honorable Nancy Pelosi, Speaker
Jason Smith, Parliamentarian