

[DISCUSSION DRAFT]

116TH CONGRESS  
2D SESSION

**H. R. \_\_\_\_**

To provide guidance for and investment in the research and development activities of the Department of Energy Office of Science, and for other purposes.

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IN THE HOUSE OF REPRESENTATIVES

M. \_\_\_\_\_ introduced the following bill; which was referred to the Committee on  
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**A BILL**

To provide guidance for and investment in the research and development activities of the Department of Energy Office of Science, and for other purposes.

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

**SECTION 1. SHORT TITLE.**

This Act may be cited as the “Department of Energy Office of Science Reauthorization Act”.

**SEC. 2. MISSION OF THE OFFICE OF SCIENCE.**

Section 209 of the Department of Energy Organization Act (42 U.S.C. 7139) is amended by adding at the end the following:

“(d) **USER FACILITIES.**—The Director shall carry out the construction, operation, and maintenance of user facilities to support the mission described in

subsection (c). As practicable, these facilities shall serve the needs of the Department, industry, the academic community, and other relevant entities for the purposes of advancing the missions of the Department.

“(e) COORDINATION.—

“(1) The Under Secretary shall ensure the coordination of the Office of Science with the other activities of the Department, and shall support joint activities among the programs of the Department.

“(2) The Director—

“(A) shall ensure the coordination of programs and activities carried out by the Office of Science;

“(B) shall coordinate with other relevant Federal agencies in supporting advancements in related research areas as appropriate; and

“(C) may form partnerships to enhance the utilization of and ensure access to user facilities by other Federal agencies.”.

### SEC. 3. BASIC ENERGY SCIENCES PROGRAM.

Section 303 of the Department of Energy Research and Innovation Act (42 U.S.C. 18641) is amended—

(1) by redesignating subsections (a) through (e) as subsections (b) through (f), respectively; and

(2) by inserting before subsection (b), as so redesignated, the following:

“(a) PROGRAM.—As part of the activities authorized under section 209 of the Department of Energy Organization Act (42 U.S.C. 7139), the Director shall carry out a research and development program in energy sciences, including materials sciences and engineering, chemistry, physical biosciences, and geosciences, to understand, model, and control matter and energy at the electronic, atomic, and molecular levels in order to provide the foundations for new energy technologies, address scientific grand challenges, and support the energy, environment, and national security missions of the Department.”;

(3) in subsection (c), as so redesignated, by inserting at the end:

“(4) ADVANCED PHOTON SOURCE UPGRADE.—

“(A) IN GENERAL.—The Secretary shall provide for the upgrade to the Advanced Photon Source described in the publication approved by the Basic Energy Sciences Advisory Committee on June 9, 2016, titled ‘Report on Facility Upgrades’.

“(B) START OF OPERATIONS.—The Secretary shall, to the maximum extent practicable, ensure that the start of full operations of the upgrade under this paragraph occurs before March 31, 2026.

“(C) FUNDING.—Out of funds authorized to be appropriated under subsection (h), there shall be made available to the Secretary to carry out the upgrade under this paragraph [ \_\_\_ for fiscal year \_\_\_ of project construction].

“(5) SPALLATION NEUTRON SOURCE PROTON POWER UPGRADE.—

“(A) IN GENERAL.—The Secretary shall provide for the proton power upgrade to the Spallation Neutron Source.

“(B) PROTON POWER UPGRADE DEFINED.—For the purposes of this paragraph, the term ‘proton power upgrade’ means the Spallation Neutron Source power upgrade described in—

“(i) the publication titled ‘Facilities for the Future of Science: A Twenty-Year Outlook’, published by the Office of Science of the Department of Energy in December, 2003;

“(ii) the publication titled ‘Four Years Later: An Interim Report on Facilities for the Future of Science: A Twenty-Year Outlook’, published by the Office of Science of the Department of Energy in August, 2007; and

“(iii) the publication approved by the Basic Energy Sciences Advisory Committee on June 9, 2016, titled ‘Report on Facility Upgrades’.

“(C) START OF OPERATIONS.—Subject to appropriations, the Secretary shall ensure that the start of full operations of the upgrade under this paragraph occurs before December 31, 2025.

【“(D) FUNDING.—Out of funds authorized to be appropriated under subsection (h), there shall be made available to the Secretary to carry out the upgrade under this paragraph [ \_\_ for fiscal year \_\_ of project construction.】】

“(6) SPALLATION NEUTRON SOURCE SECOND TARGET STATION.—

“(A) IN GENERAL.—The Secretary shall provide for a second target station for the Spallation Neutron Source.

“(B) DEFINITION OF SECOND TARGET STATION.—For the purposes of this paragraph, the term ‘second target station’ means the Spallation Neutron Source second target station described in—

“(i) the publication titled, ‘Facilities for the Future of Science: A Twenty-Year Outlook’, published by the Office of Science of the Department of Energy in December, 2003; and

“(ii) the publication titled, ‘Four Years Later: An Interim Report on Facilities for the Future of Science: A Twenty-Year Outlook’, published by the Office of Science of the Department of Energy in August, 2007; and

“(iii) the publication approved by the Basic Energy Sciences Advisory Committee on June 9, 2016, titled ‘Report on Facility Upgrades’.

“(C) START OF OPERATIONS.—The Secretary shall, to the maximum extent practicable, ensure that the start of full operations of the second target station under this paragraph occurs before December 31, 2030, with the option for early operation in 2028.

“(D) FUNDING.—Out of funds authorized to be appropriated under subsection (h), there shall be made available to the Secretary to carry out activities under this paragraph, including construction,

“(7) ADVANCED LIGHT SOURCE UPGRADE.—

“(A) IN GENERAL.—The Secretary shall provide for the upgrade to the Advanced Light Source described in the publication approved by the Basic Energy Sciences Advisory Committee on June 9, 2016, titled ‘Report on Facility Upgrades’.

“(B) START OF OPERATIONS.—Subject to the availability of appropriations, the Secretary shall ensure that the start of full operations of the upgrade under this paragraph occurs before December 31, 2026.

【“(C) FUNDING.—Out of funds authorized to be appropriated under subsection (h), there shall be made available to the Secretary to carry out the upgrade under this paragraph [ \_\_ for fiscal year \_\_ of project construction.]】

“(8) LINAC COHERENT LIGHT SOURCE II HIGH ENERGY UPGRADE.—

“(A) IN GENERAL.—The Secretary shall provide for the upgrade to the Linac Coherent Light Source II facility described in the publication approved by the Basic Energy Sciences Advisory Committee on June 9, 2016, titled ‘Report on Facility Upgrades’.

“(B) START OF OPERATIONS.—The Secretary shall, to the maximum extent practicable, ensure that the start of full operations of the upgrade under this paragraph occurs before December 31, 2025.

【“(C) FUNDING.—Out of funds authorized to be appropriated under subsection (h), there shall be made available to the Secretary to carry out the upgrade under this paragraph [ \_\_ for fiscal year \_\_ of project construction.]”]; and】

(4) by adding at the end the following:

“(d) COMPUTATIONAL MATERIALS AND CHEMISTRY SCIENCE CENTERS.—

“(1) IN GENERAL.—The Director shall support a program of research and development for the application of advanced computing practices to foundational and emerging research problems in chemistry and materials science.

“(2) COMPUTATIONAL MATERIALS AND CHEMISTRY SCIENCE CENTERS.—

“(A) IN GENERAL.—In carrying out the activities authorized under paragraph (1), the Director shall select and establish computational materials and chemistry science centers to develop open-source, robust, and validated computational codes and user-friendly software, coupled with innovative use of experimental and theoretical data, to enable the design, discovery, and development of new materials and chemical systems.

“(B) SELECTION.—The Director shall select centers under paragraph (1) on a competitive, merit-reviewed basis. The Director shall consider applications from the National Laboratories, institutes of higher education, multi-institutional collaborations, and other appropriate entities.

“(C) DURATION.—A center established under this subsection shall receive support for a period of not more than 5 years, subject to the availability of appropriations.

“(D) RENEWAL.—Upon the expiration of any period of support of a center under this subsection, the Director may renew support for the center, on a merit-reviewed basis, for a period of not more than 5 years.

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

“(e) MATERIALS RESEARCH DATABASE.—

“(1) IN GENERAL.—The Director shall support the development of a web-based platform to provide access to a database of computed information on known and predicted materials properties and

computational tools to accelerate breakthroughs in materials discovery and design.

“(2) PROGRAM.—In carrying out this section, the Director shall—

“(A) conduct cooperative research with industry, academia, and other research institutions to facilitate the design of novel materials;

“(B) leverage existing high performance computing systems to conduct high throughput calculations, and develop computational and data mining algorithms for the prediction of material properties;

“(C) strengthen the foundation for new technologies and advanced manufacturing; and

“(D) drive the development of advanced materials for applications that span the Department’s missions in energy, environment, and national security.

“(f) COORDINATION.—In carrying out this section, the Director shall leverage and activities across the Department, including computational materials and chemistry science centers established under subsection (c).

“(g) WORKFORCE DEVELOPMENT.—The Director of the Office of Basic Energy Sciences shall support the development of an energy sciences workforce through programs that facilitate collaboration between K–12 and university students and the National Laboratories, including through the use of proven techniques to expand the number of individuals from underrepresented groups pursuing and attaining skills or undergraduate and graduate degrees relevant to the Office’s mission.

“(h) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Secretary to carry out the activities described in this section—

“(1) [\$\_\_\_ for fiscal year 2021; etc.”.]

#### SEC. 4. BIOLOGICAL AND ENVIRONMENTAL RESEARCH.

(a) PROGRAM.—Section 306 of the Department of Energy Research and Innovation Act (42 U.S.C. 18644) is amended—

(1) by redesignating subsections (a) through (c) as subsections (b) through (d), respectively; and

(2) by inserting before subsection (b), as so redesignated, the following:

“(a) PROGRAM.—As part of the activities authorized under section 209 of the Department of Energy Organization Act (42 U.S.C. 7139), and coordinated with the activities authorized under section 604 and section 606, the Director shall carry out a program of research and development in the areas of biological systems science and climate and environmental science, including subsurface science, to support the energy, environmental, and national security missions of the Department.”.

(b) BIOENERGY RESEARCH CENTERS.—Section 977 of the Energy Policy Act of 2005 (42 U.S.C. 16317) is amended by adding at the end the following:

“(f) BIOENERGY RESEARCH CENTERS.—

“(1) IN GENERAL.—In carrying out activities under subsection (a), the Director shall support bioenergy research centers to accelerate advanced research and development of biomass-based liquid transportation fuels, bioenergy, or biobased materials, chemicals, and products that are produced from a variety of regionally diverse feedstocks. Such activities shall include—

“(A) accelerating the domestication of bioenergy-relevant plants and microbes to enable high-impact, value-added coproduct development at multiple points in the bioenergy supply chain;

“(B) developing the science and technological advances to ensure sustainability at each step in the process of creating biofuels and bioproducts from lignocellulose; and

“(C) using the latest tools in molecular biology, chemical engineering, and computational and robotics technologies to transform biomass into biofuels and bioproducts.

“(2) SELECTION AND DURATION.—A center established under paragraph (1) shall be selected on a competitive, merit-reviewed basis for a period of 5 years beginning on the date of establishment of that



center. A center already in existence on the date of enactment of this Act may continue to receive support for a period of 5 years beginning on the date of establishment of that center.

“(3) RENEWAL.—After the end of the period described in paragraph (2), the Director may renew support for the center for a second period of 5 years on a merit-reviewed basis.

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

“(5) ACTIVITIES.—Centers shall undertake research activities to accelerate the production of biofuels and bioproducts from advanced biomass resources by identifying the most suitable species of plants for use as energy crops; and improving methods of breeding, propagation, planting, harvesting, storage and processing, including the following:

“(A) Research activities to increase sustainability, including—

“(i) advancing knowledge of how bioenergy crop interactions with biotic and abiotic environmental factors influence crop growth, yield, and quality;

“(ii) identifying the most impactful research areas through process integration and technoeconomic evaluation of biomass-to-fuels technologies that address the economics of biofuels and bioproducts production; and

“(iii) utilizing multiscale modeling to advance predictive understanding of biofuel cropping ecosystems.

“(B) Research activities to further feedstock development, including—

“(i) developing genetic tools, high-throughput analytical tools, and biosystems design approaches to enhance bioenergy feedstocks with improved traits for yield, water use, nutrient uptake and recycling, resilience to biotic and abiotic stress, and conversion to biofuels and bioproducts;

“(ii) conducting field testing of new potential bioenergy feedstock crops under environmentally relevant conditions across multiple geographic regions to assess viability and robustness; and

“(iii) developing quantitative models informed by experimentation to predict how bioenergy feedstocks perform under different geographic and environmentally relevant conditions.

“(C) Research activities to improve lignocellulosic deconstruction and separation methods, including—

“(i) developing feedstock-agnostic deconstruction processes capable of efficiently fractionating biomass into targeted output streams;

“(ii) gaining a detailed understanding of plant cell wall biosynthesis, composition, structure, and properties during deconstruction; and

“(iii) improving enzymes and approaches for biomass breakdown and cellulose, hemicellulose, and lignin processing.

“(D) Research activities to improve the feedstock conversion process for advanced biofuels and bioproducts, including—

“(i) developing high-throughput methods to screen or select high-performance strains to improve product formation rates, yields, and selectivity;

“(ii) establishing a broader set of platform microorganisms suitable for metabolic engineering to produce biofuels and bioproducts, as well as high-throughput methods for experimental validation of gene function;

“(iii) developing new approaches and models to predict optimal production pathways;

“(iv) developing techniques to enhance microbial robustness for tolerating toxins to improve fermentation yields

and to gain a better understanding of the cellular and molecular bases of tolerance for major chemical classes of inhibitors found in these processes;

“(v) advancing technologies for consolidated bioprocessing;

“(vi) identifying, creating, and optimizing microbial and chemical pathways to produce promising, atom-economical intermediates and final bioproducts from biomass that are less toxic and more environmentally benign compared to current products produced from petroleum or natural gas. Atom-economical processes minimize atoms lost from the starting material to attain the highest possible yield;

“(vii) developing high-throughput, real-time, in situ analytical techniques to understand and characterize the pre- and post-bioproduct separation streams in detail;

“(viii) creating methodologies for efficiently identifying viable target molecules, identifying high-value bioproducts in existing biomass streams, and utilizing current byproduct streams; and

“(ix) identifying and improving plant feedstocks with enhanced extractable levels of desired bioproducts or bioproduct precursors, including lignin streams.

“(6) INDUSTRY PARTNERSHIPS.—Centers shall establish industry partnerships to translate research results to commercial applications.”.

(c) LOW-DOSE RADIATION RESEARCH PROGRAM.—Section 306(d) of the Department of Energy Research and Innovation Act (42 U.S.C. 18644(c)), as redesignated under subsection (a), is amended to read as follows:

“(d) LOW-DOSE RADIATION RESEARCH PROGRAM.—

“(1) IN GENERAL.—The Secretary shall carry out a research program on low-dose and low dose-rate radiation to—

“(A) enhance the scientific understanding of, and reduce uncertainties associated with, the effects of exposure to low-dose and low dose-rate radiation; and

“(B) inform improved risk-assessment and risk-management methods with respect to such radiation.

“(2) PROGRAM COMPONENTS.—In carrying out the program required under paragraph (1), the Secretary shall—

“(A) support and carry out the directives under section 106 of the American Innovation and Competitiveness Act (42 U.S.C. 6601 note), with respect to low dose and low-dose rate radiation research, in coordination with the Physical Science Subcommittee of the National Science and Technology Council;

“(B) leverage the collective body of knowledge from prior and existing low-dose and low dose-rate radiation research;

“(C) engage with other Federal agencies, research communities, and potential users of information produced under this section, including institutions performing or utilizing radiation research, medical physics, radiology, health physics, and emergency response measures; and

“(D) support education and outreach activities to disseminate information and promote public understanding of low-dose radiation, with a focus on non-emergency situations such as medical physics and naturally occurring radiation.

“(3) RESEARCH PLAN.—

“(A) LONG-TERM STRATEGIC AND PRIORITIZED RESEARCH AGENDA.—Not later than 90 days after the date of enactment of this Act, the Secretary shall enter into an agreement with the National Academy of Sciences to develop a long-term strategic and prioritized research agenda for the program described in paragraph (2).

“(B) SUBMITTAL TO CONGRESS.—Not later than one year after the date of enactment of this Act, the Secretary shall transmit this research plan developed in subparagraph (A) to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate.

“(4) PROGRAM EVALUATION.—

“(A) Not later than three years after the date of enactment of this Act, and every two years thereafter, the Secretary shall enter into agreements with an independent external entity to perform a program evaluation.

“(B) The Secretary shall transmit these program evaluations performed in subparagraph (A) to the Committee on Science, Space, and Technology of the House of Representatives and the Committee on Energy and Natural Resources of the Senate.

“(5) DEFINITIONS.—In this subsection:

“(A) LOW-DOSE RADIATION.—The term ‘low-dose radiation’ means a radiation dose of less than 100 millisieverts.

“(B) LOW DOSE-RATE RADIATION.—The term ‘low dose-rate radiation’ means a radiation dose rate of less than 5 millisieverts per hour.

“(6) RULE OF CONSTRUCTION.—Nothing in this subsection shall be construed to subject any research carried out by the Secretary for the program under this subsection to any limitations described in section 977(e) of the Energy Policy Act of 2005 (42 U.S.C. 16317(e)).

“(7) FUNDING.—For purposes of carrying out this subsection, the Secretary is authorized to make available from funds provided to the Biological and Environmental Research Program—

“(A) \$20,000,000 for fiscal year 2021;

“(B) \$20,000,000 for fiscal year 2022;

“(C) \$30,000,000 for fiscal year 2023; and

“(D) \$40,000,000 for fiscal year 2024.”.

(d) CLIMATE AND ENVIRONMENTAL SCIENCE ACTIVITIES.—Section 306 of the Department of Energy Research and Innovation Act (42 U.S.C. 18644) is further amended by adding at the end the following:

“(e) CLIMATE AND ENVIRONMENTAL SCIENCE ACTIVITIES.—

“(1) IN GENERAL.—As part of the activities authorized under subsection (a), and in coordination with activities carried out under subsection (b), the Director shall carry out climate and environmental science research, which shall include activities to—

“(A) understand, observe, and model the response of Earth’s atmosphere and biosphere to increased concentrations of greenhouse gas emissions and any associated changes in climate;

“(B) understand the processes for immobilization, or removal of, and understand the movement of, energy production-derived contaminants such as radionuclides and heavy metals, and understand the process of sequestration and transformation of carbon dioxide in subsurface environments; and

“(C) inform potential mitigation and adaptation options for increased concentrations of greenhouse gas emissions and any associated changes in climate.

“(2) SUBSURFACE BIOGEOCHEMICAL RESEARCH.—

“(A) IN GENERAL.—As part of the activities described in paragraph (1), the Director shall carry out research to advance a fundamental understanding of coupled physical, chemical, and biological processes for controlling the movement of sequestered carbon and subsurface environmental contaminants.

“(B) COORDINATION.—

“(i) DIRECTOR.—The Director shall carry out activities under this paragraph in accordance with priorities established by

the Under Secretary to support and accelerate the decontamination of relevant facilities managed by the Department.

“(ii) UNDER SECRETARY.—The Under Secretary shall ensure the coordination of activities of the Department, including activities under this paragraph, to support and accelerate the decontamination of relevant facilities managed by the Department.

“(3) CLIMATE AND EARTH MODELING.—As part of the activities described in paragraph (1), the Director, in collaboration with the Advanced Scientific Computing Research program described in section \_\_\_, shall carry out research to develop, evaluate, and use high-resolution regional climate, global climate, and Earth models to inform decisions on reducing the impacts of a changing climate. Such modeling shall include, among other critical elements, greenhouse gas emissions, land use, and interaction among human and Earth systems.

“(4) MID-SCALE FUNDING MECHANISM.—Any of the activities authorized in subsection (e) may be carried out by competitively selected mid-scale, multi-institutional research centers in lieu of individual research grants, or large-scale experiments or user facilities.

“(f) USER FACILITIES.—

“(1) IN GENERAL.—The Director shall carry out a program for the development, construction, operation, and maintenance of user facilities to enhance the collection and analysis of observational data related to complex biological, climate, and environmental systems.

“(2) FACILITY REQUIREMENTS.—To the maximum extent practicable, the user facilities developed, constructed, operated, or maintained under paragraph (1) shall include—

“(A) distributed field research and observation platforms for understanding earth system processes;

“(B) instruments and modeling resources for understanding the physical, chemical, and cellular processes of biological and environmental systems;

“(C) integrated high-throughput sequencing, DNA design and synthesis, and computational analysis; and

“(D) such other facilities as the Director considers appropriate, consistent with section 209 of the Department of Energy Organization Act (42 U.S.C. 7139).

“(3) CLIMATE RESEARCH FACILITIES.—In carrying out the activities authorized under paragraph (c)(1), the Director shall establish and operate user facilities to advance the collection, validation, and analysis of atmospheric data, including activities to advance knowledge and improve model representations and measure the impact of atmospheric gases, aerosols, and clouds on earth and environmental systems.

“(A) SELECTION.—The Director shall select user facilities under paragraph (1) on a competitive, merit-reviewed basis. The Director shall consider applications from the National Laboratories, institutes of higher education, multi-institutional collaborations, and other appropriate entities.

“(B) TERMINATION.—Consistent with the existing authorities of the Department, the Director may terminate an underperforming user facility for cause during the performance period.

“(4) COORDINATION.—In carrying out the program authorized in paragraph (1), the Director shall ensure that the Office of Science—

“(A) consults and coordinates with the National Oceanic Atmospheric Administration, the Environmental Protection Agency, and any other relevant Federal agency on the collection, validation, and analysis of atmospheric data; and

“(B) coordinates with relevant stakeholders, including institutes of higher education, nonprofit research institutions, industry, State, local, and tribal governments, and other appropriate entities to



ensure access to the best available relevant atmospheric and historical weather data.

“(g) COASTAL ZONE RESEARCH INITIATIVE.—

“(1) IN GENERAL.—The Director shall carry out a basic research program to enhance the understanding of coastal ecosystems. In carrying out this program, the Director shall prioritize efforts to enhance the collection of observational data, and shall develop models to analyze the ecological, biogeochemical, hydrological and physical processes that interact in coastal zones.

“(2) NATIONAL SYSTEM FOR COASTAL DATA COLLECTION.—The Director shall establish an integrated system of field research sites in order to improve the quantity and quality of observational data, and that encompass at least three of the major land water interfaces of the United States, including—

“(A) the Great Lakes region;

“(B) the Pacific coast;

“(C) the Atlantic coast;

“(D) the Arctic; and

“(E) the Gulf coast.

“(3) EXISTING INFRASTRUCTURE.—In carrying out the programs and establishing the field research sites under paragraph (1) and (2), the Secretary shall leverage existing Department of Energy R&D infrastructure, including the Department’s existing marine sciences lab.

“(4) COORDINATION.—For the purposes of carrying out the programs and establishing the field research sites under the Initiative, the Secretary may enter into agreements with Federal Departments and agencies with complementary capabilities.

“(5) REPORT.—Not less than 2 years after the date of the enactment of this Act, the Director shall provide to the Committee on Science, Space, and Technology and the Committee on Appropriations of the

House of Representatives and the Committee on Energy and Natural Resources and the Committee on Appropriations of the Senate a report examining whether the system described in this section should be established as a National User Facility.

“(h) WORKFORCE DEVELOPMENT.—The Director of the Office of Biological and Environmental Research shall support the development of a biological and environmental sciences workforce through programs that facilitate collaboration between K–12 and university students and the National Laboratories, including through the use of proven techniques to expand the number of individuals from underrepresented groups pursuing and attaining skills or undergraduate and graduate degrees relevant to the Office’s mission.

“(i) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Secretary to carry out the activities described in this section—

【“(1) [\$\_\_\_ for fiscal year 2021; etc.”.】】

## SEC. 5. ADVANCED SCIENTIFIC COMPUTING RESEARCH PROGRAM.

Section 304 of the Department of Energy Research and Innovation Act (42 U.S.C. 18642) is amended—

(1) by redesignating subsections (a) through (c) as subsections (b) through (d), respectively; and

(2) by inserting before subsection (b), as so redesignated, the following:

“(a) IN GENERAL.—As part of the activities authorized under section 209 of the Department of Energy Organization Act (42 U.S.C. 7139), the Director shall carry out a research, development, demonstration, and commercial application program to advance computational and networking capabilities for data-driven discovery and to analyze, model, simulate, and predict complex phenomena relevant to the development of new energy technologies and the competitiveness of the United States.”;

(3) in subsection (b) (as redesignated under paragraph (1))—

(A) by striking “The Director” and inserting “(1) DIRECTOR.—The Director”; and

(B) by adding at the end the following:

“(2) COORDINATION.—The Under Secretary shall ensure the coordination of the activities of the Department, including activities under this section, to determine and meet the computational and networking research and facility needs of the Office of Science and all other relevant energy technology and energy efficiency programs within the Department, and across the Federal Government.”;

(4) by amending subsection (d), as so redesignated, to read as follows:

“(d) APPLIED MATHEMATICS AND SOFTWARE DEVELOPMENT FOR HIGH-END COMPUTING SYSTEMS AND COMPUTER SCIENCES RESEARCH.—

“(1) IN GENERAL.—The Director shall carry out activities to develop, test, and support—

“(A) mathematics, statistics, and algorithms for modeling complex systems on advanced computing architectures; and

“(B) tools, languages, programming environments, and operations for high-end computing systems (as defined in section 2 of the American Super Computing Leadership Act (15 U.S.C. 5541), as renamed by this section).

“(2) PORTFOLIO BALANCE.—The Director shall maintain a balanced portfolio within the advanced scientific computing research and development program established under section 976 of the Energy Policy Act of 2005 (42 U.S.C. 16316) that supports robust investment in—

“(A) applied mathematical, computational, and computer sciences research needs relevant to the mission of the Department; and

“(B) associated high-performance computing hardware and facilities.”;

(5) by inserting after subsection (d) the following:

“(e) NEXT GENERATION COMPUTING PROGRAM.—The Secretary shall establish a program to develop and implement a strategy for achieving computing systems with capabilities beyond exascale computing systems. In establishing this program, the Secretary shall

“(1) maintain foundational research programs in mathematical, computational, and computer sciences focused on new and emerging computing needs within the mission of the Department, including but not limited to novel computing architectures, novel approaches to modeling and simulation, artificial intelligence and scientific machine learning, quantum computing, and research to address extreme heterogeneity; and

“(2) retain best practices and maintain support for essential hardware and software elements of the Exascale Computing Project that are necessary for sustaining the vitality of a long-term exascale ecosystem.

“(f) ENERGY EFFICIENT COMPUTING PROGRAM.—

“(1) IN GENERAL.—The Secretary shall support a program of research, development, and demonstration of energy efficient computing technologies relevant to advanced computing applications.

“(2) EXECUTION.—

“(A) PROGRAM.—In carrying out the program under subsection (d)(1), the Secretary shall—

“(i) establish a partnership for National Laboratories, industry partners, and institutions of higher education for codesign of energy efficient hardware, technology, software, and applications across all applicable program offices of the Department, and provide access to energy efficient computing resources to such partners;

“(ii) develop hardware and software technologies that decrease the energy needs of advanced computing practices;

“(B) SELECTION OF PARTNERS.—In selecting participants for the partnership established under subparagraph (A)(i), the Secretary shall select participants through a competitive, merit review process.

“(g) ENERGY SCIENCES NETWORK.—

“(1) IN GENERAL.—The Secretary shall provide for an upgrade to the Energy Sciences Network user facility in order to meet Federal research needs for highly reliable data transport capabilities optimized for the requirements of large-scale science.

“(2) CAPABILITIES.—In carrying out paragraph (1), the Secretary shall ensure the following capabilities:

“(A) To provide high bandwidth scientific networking across the continental United States and the Atlantic Ocean.

“(B) To maximize network reliability.

“(C) To protect the network and data from cyber-attacks.

“(D) To support exponentially increasing levels of data from the Department’s scientific user facilities, experiments, and sensors.

“(E) To integrate heterogeneous computing frameworks and systems.

“(h) QUANTUM SCIENCE NETWORK.—The Secretary shall provide for a program to support the research, development, and demonstration of a quantum computing network.

“(i) WORKFORCE DEVELOPMENT.—The Director of the Office of Advanced Scientific Computing Research shall support the development of a computational science workforce through programs that facilitate collaborations between K–12 and university students and the National Laboratories.

“(j) REPORT.—Not later than one year after the date of 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 on the advanced scientific computing research program authorized in this section, including—

“(1) the development and implementation of the strategy outlined in paragraph (b)(1);

“(2) the activities conducted under subparagraph (d)(2)(A); and

“(3) the coordination and management of the Program to ensure an integrated research program across the Department.

“(k) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Secretary to carry out the activities described in this section—

【“(1) [\$\_\_\_ for fiscal year 2021; etc.”.】】

## SEC. 6. FUSION ENERGY RESEARCH.

(a) PROGRAM.—Section 307 of the Department of Energy Research and Innovation Act (42 U.S.C. 18645) is amended—

(1) by redesignating subsections (a) through (g) as subsections (b) through (h), respectively; and

(2) by inserting before subsection (b), as so redesignated, the following:

“(a) PROGRAM.—As part of the activities authorized under section 209 of the Department of Energy Organization Act (42 U.S.C. 7139) and section 972 of the Energy Policy Act of 2005 (42 U.S.C. 16312), the Director shall carry out a fusion energy sciences research and enabling technology development program to effectively address the scientific and engineering challenges to building a cost competitive fusion power plant and to establish a competitive fusion power industry in the United States. As part of this program, the Director shall carry out research activities to expand the fundamental understandings of plasmas and matter at very high temperatures and densities for fusion applications and for other plasma science applications.”;

(3) by amending subsection (d) to read as follows:

“(d) INERTIAL FUSION RESEARCH AND DEVELOPMENT.—

“(1) IN GENERAL.—The Director shall carry out a program of research and technology development in inertial fusion for energy applications, including ion beam, laser, and pulsed power fusion systems.

“(2) AUTHORIZATION OF APPROPRIATIONS.— Out of funds authorized to be appropriated under subsection (m), there are authorized to be appropriated to the Secretary to carry out the activities described in subsection (d)—

“(A) \$25,000,000 for fiscal year 2021;

“(B) \$26,250,000 for fiscal year 2022;

“(C) \$27,563,000 for fiscal year 2023;

“(D) \$28,941,000 for fiscal year 2024; and

“(E) \$30,377,000 for fiscal year 2025.”;

(2) by amending subsection (e) to read as follows:

“(e) ALTERNATIVE AND ENABLING CONCEPTS.—

“(1) IN GENERAL.—The Director shall support research and development activities and facility operations at institutions of higher education, National Laboratories, and private facilities in the United States for a portfolio of alternative and enabling fusion energy concepts that may provide solutions to significant challenges to the establishment of a commercial magnetic fusion power plant, prioritized based on the ability of the United States to play a leadership role in the international fusion research community. Fusion energy concepts and activities explored under this paragraph may include—

“(A) high magnetic field approaches facilitated by high temperature superconductors;

“(B) advanced stellarator concepts;

“(C) non-tokamak confinement configurations operating at low magnetic fields;

“(D) magnetized target fusion energy concepts;

“(E) liquid metals to address issues associated with fusion plasma interactions with the inner wall of the encasing device;

“(F) immersion blankets for heat management and fuel breeding;

“(G) advanced scientific computing activities: and

“(H) other promising fusion energy concepts identified by the Director.

“(2) INNOVATION NETWORK FOR FUSION ENERGY.—

“(A) \_\_\_.—The Secretary, acting through the Office of Science, shall support a program to provide fusion energy researchers with access to scientific and technical resources and expertise at facilities supported by the Department to advance innovative fusion energy technologies toward commercial application.

“(B) AWARDS.—Financial assistance under the program established in subsection (a) may be in the form of grants, vouchers, equipment loans, or contracts to private entities.

“(C) \_\_\_.—The Secretary shall include experts with relevant expertise from the private sector in the reviews of proposals submitted under this program.

“(3) AUTHORIZATION OF APPROPRIATIONS.— Out of funds authorized to be appropriated under subsection (m), there are authorized to be appropriated to the Secretary to carry out the activities described in subsection (e) —

“(A) \$100,000,000 for fiscal year 2021;

“(B) \$105,000,000 for fiscal year 2022;

“(C) \$110,250,000 for fiscal year 2023;

“(D) \$115,763,000 for fiscal year 2024; and

“(E) \$121,551,000 for fiscal year 2025.”; and



(4) by adding at the end the following:

“(i) MILESTONE-BASED DEVELOPMENT PROGRAM.—

“(1) IN GENERAL.—Using the authority of the Secretary under section 646(g) of the Department of Energy Organization Act (42 U.S.C. 7256(g)), notwithstanding paragraph (10) of such section, the Secretary shall establish, within 3 months of enactment of this Act, a milestone-based fusion energy development program that requires projects to meet particular technical milestones before a participant is awarded funds by the Department.

“(2) PURPOSE.—The purpose of the program established by paragraph (1) shall be to support the development of a U.S.-based fusion power industry through the research and development of technologies that will enable the construction of new full-scale fusion systems capable of demonstrating significant improvements in the performance of such systems, as defined by the Secretary, within 10 years of the enactment of this Act.

“(3) ELIGIBILITY.—Any entity is eligible to participate in the program provided that the Under Secretary has deemed it as having the necessary resources, expertise, and intention to construct a fusion demonstration facility in the United States.

“(4) REQUIREMENTS.—In carrying out the milestone-based program under paragraph (1), the Secretary shall, for each relevant project—

“(A) request proposals from eligible entities, as determined by the Secretary, that include proposed technical milestones, including estimated project timelines and total costs;

“(B) award funding of a predetermined amount to projects that successfully meet proposed milestones under paragraph (1), or for expenses deemed reimbursable by the Secretary, in accordance with terms negotiated for an individual award; and

“(C) communicate regularly with selected eligible entities and, if the Secretary deems appropriate, exercise small amounts of flexibility for technical milestones as projects mature.

“(5) AWARDS.—For the program established under paragraph (1)—

“(A) an award recipient shall be responsible for all costs until milestones are achieved, or reimbursable expenses are reviewed and verified by the Department; and

“(B) should an awardee not meet the milestones described in paragraph (4), the Secretary may end the partnership with an award recipient and use the remaining funds in the ended agreement for new or existing projects carried out under this section.

“(6) APPLICATIONS.—Any project proposal submitted to the program under paragraph (1) shall be evaluated based upon its scientific, technical, and business merits through a peer-review process, which shall include reviewers with appropriate expertise from the private sector and the investment community.

“(7) PROJECT MANAGEMENT.—In carrying out projects under this program and assessing the completion of their milestones in accordance with paragraph (4), the Secretary shall consult with experts that represent diverse perspectives and professional experiences, including those from the private sector, to ensure a complete and thorough review.

“(8) PROGRAMATIC REVIEW.—Not later than 4 years after the date of enactment of this Act, the Secretary shall enter into a contractual arrangement with the National Academy of Sciences to review and provide a report describing the findings of this review to the House Committee on Science, Space, and Technology and the Senate Committee on Energy and Natural Resources on the program established under this paragraph (1) that assesses—

“(A) the benefits and drawbacks of a milestone-based fusion program as compared to traditional program structure funding models at the Department;

“(B) lessons-learned from program operations; and

“(C) any other matters the Secretary determines regarding the program.

“(9) ANNUAL REPORT.—As part of the annual budget request submitted for each fiscal year, the Secretary shall provide the House Committee on Science, Space, and Technology and the Senate Committee on Energy and Natural Resources a report describing partnerships supported by the program established under paragraph (1) during the previous fiscal year.

“(10) AUTHORIZATIONS FOR APPROPRIATIONS.— Out of funds authorized to be appropriated under subsection (m), there are authorized to be appropriated to the Secretary to carry out the activities described in subsection (i), to remain available until expended—

“(A) \$45,000,000 for fiscal year 2021;

“(B) \$110,000,000 for fiscal year 2022;

“(C) \$140,000,000 for fiscal year 2023;

“(D) \$110,000,000 for fiscal year 2024; and

“(E) \$45,000,000 for fiscal year 2025.

“(j) GENERAL PLASMA SCIENCE AND APPLICATIONS.—The Director shall support research in general plasma science and high energy density physics that advance the understanding of the scientific community of fundamental properties and complex behavior of matter to control and manipulate plasmas for a broad range of applications.

“(k) SENSE OF CONGRESS.—It is the sense of Congress that the United States should support a robust, diverse program in addition to providing sufficient support to, at a minimum, meet its commitments to ITER and maintain the schedule of the project as determined by the Secretary in coordination with the ITER Organization at the time of the enactment of this Act. It is further the sense of Congress that developing the scientific basis for fusion, providing research results key to the success of ITER, and training the next generation of fusion scientists are of critical importance to the United States and should in no way be diminished by participation of the United States in the ITER project.

“(l) WORKFORCE DEVELOPMENT.—The Director of the Office of Fusion Energy Sciences shall support the development of a fusion and plasma science workforce through programs that facilitate collaboration between K–12 and university students and the National Laboratories, including through the use of proven techniques to expand the number of individuals from underrepresented groups pursuing and attaining skills or undergraduate and graduate degrees relevant to the Office’s mission.

“(m) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Secretary to carry out the activities described in this section—

【“(1) 【\$\_\_\_ for fiscal year 2021; etc.”.】】

(b) ITER.—Section 972(c) of the Energy Policy Act of 2005 (42 U.S.C. 16312) is amended to read as follows:

“(c) UNITED STATES PARTICIPATION IN ITER.—

“(1) IN GENERAL.—There is authorized United States participation in the construction and operations of the ITER project, as agreed to under the April 25, 2007 ‘Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project’. The Director shall coordinate and carry out the responsibilities of the United States with respect to this Agreement.

“(2) REPORT.—Not later than 1 year after the date of enactment of this Act, the Secretary shall submit to Congress a report providing an assessment of the most recent schedule for ITER that has been approved by the ITER Council.

“(3) AUTHORIZATION OF APPROPRIATIONS.—Out of funds authorized to be appropriated under section 307(m) of the Department of Energy Research and Innovation Act (42 U.S.C. 18645), there shall be made available to the Secretary to carry out the construction of ITER —

“(A) 【\$\_\_\_ for fiscal year \_\_\_\_】;”.

SEC. 7. HIGH ENERGY PHYSICS PROGRAM.

(a) PROGRAM.—Section 305 of the Department of Energy Research and Innovation Act (42 U.S.C. 18643) is amended—

(1) by redesignating subsections (b) through (d) as subsections (d) through (f), respectively; and

(2) by inserting the following after subsection (a):

“(b) PROGRAM.—As part of the activities authorized under section 209 of the Department of Energy Organization Act (42 U.S.C. 7139), the Director shall carry out a research program on the elementary constituents of matter and energy and the nature of space and time.

“(c) HIGH ENERGY FRONTIER RESEARCH.—As part of the program described in subsection (a), the Director shall carry out research using high energy accelerators and advanced detectors to create and study interactions of novel particles and investigate fundamental forces.”.

(b) INTERNATIONAL COLLABORATION.—Section 305(d) of the Department of Energy Research and Innovation Act (42 U.S.C. 18643(d)), as redesignated under subsection (a), is amended to read as follows:

“(d) INTERNATIONAL COLLABORATION.—The Director shall—

“(1) as practicable and in coordination with other appropriate Federal agencies as necessary, ensure the access of United States researchers to the most advanced accelerator facilities and research capabilities in the world, including the Large Hadron Collider;

“(2) to the maximum extent practicable, continue to leverage United States participation in the Large Hadron Collider, and prioritize expanding international partnerships and investments in the Long-Baseline Neutrino Facility; and

“(3) to the maximum extent practicable, prioritize engagement in collaborative efforts in support of future international facilities that would provide access to the most advanced accelerator facilities in the world to United States researchers.”.

(c) DARK ENERGY AND DARK MATTER RESEARCH.—Section 305(f) of the Department of Energy Research and Innovation Act (42 U.S.C. 18645(e)), as redesignated under subsection (a), is amended to read as follows:

“(f) DARK ENERGY AND DARK MATTER RESEARCH.—The Director shall carry out research activities on the nature of dark energy and dark matter. These activities shall be consistent with the research priorities identified by the High Energy Physics Advisory Panel or the National Academy of Sciences, and may include—

“(1) collaborations with the National Aeronautics and Space Administration, the National Science Foundation, or international partners on relevant projects; and

“(2) the development of space-based, land-based, and underground facilities and experiments.”.

(d) SECTION .—Section 305 of the Department of Energy Research and Innovation Act (42 U.S.C. 18645), as amended, is further amended by adding at the end the following:

“(g) FACILITY CONSTRUCTION AND MAJOR ITEMS OF EQUIPMENT.—

“(1) PROJECTS.—Consistent with the Office of Science’s project management practices, the Director shall support construction or fabrication of—

“(A) an international Long-Baseline Neutrino Facility based in the United States;

“(B) the Proton Improvement Project II;

“(C) Second Generation Dark Matter experiments;

“(D) the Dark Energy Spectroscopic Instrument;

“(E) the Large Synoptic Survey Telescope camera;

“(F) upgrades to components of the Large Hadron Collider; and

“(G) other high priority projects recommended in the most recent report of the Particle Physics Project Prioritization Panel of the High Energy Physics Advisory Panel.

“(2) LONG-BASELINE NEUTRINO FACILITY.—

“(A) IN GENERAL.—The Secretary shall support construction of a Long-Baseline Neutrino Facility to facilitate the international Deep Underground Neutrino Experiment to examine the fundamental properties of neutrinos, explore physics beyond the Standard Model, and better clarify the nature of matter and antimatter.

“(B) START OF OPERATIONS.—The Secretary shall, to the maximum extent practicable, ensure that the start of full operations of the facility under this subsection occurs before December 31, 2026.

“(C) FUNDING.—Out of funds authorized to be appropriated under subsection (1), there shall be made available to the Secretary to carry out construction of the facility under this subsection—

[ \_\_ for fiscal year \_\_ ]

“(3) PROTON IMPROVEMENT PLAN–II ACCELERATOR UPGRADE PROJECT.—

“(A) IN GENERAL.—The Secretary of Energy shall support construction of the Proton Improvement Plan II, an upgrade to the Fermilab accelerator complex identified in the 2014 Particle Physics Project Prioritization Panel (P5) report titled ‘Building for Discovery’, to provide the world’s most intense beam of neutrinos to the international Long Baseline Neutrino Facility as well as future high energy physics experiments. The Secretary of Energy shall work with international partners to enable further significant contributions to the capabilities of this project.

“(B) START OF OPERATIONS.—The Secretary shall, to the maximum extent practicable, ensure that the start of full operations of the facility under this section occurs before December 31, 2027.

“(C) FUNDING.—Out of funds authorized to be appropriated under subsection (l), there shall be made available to the Secretary to carry out construction of the facility under this subsection—

[ \_\_ for fiscal year \_\_ ]

“(h) ACCELERATOR AND DETECTOR UPGRADES.—The Director shall upgrade accelerator facilities and detectors, as necessary and appropriate, to increase beam power, sustain high reliability, and improve precision measurement to advance the highest priority particle physics research programs. In carrying out facility upgrades, the Director shall continue to work with international partners, when appropriate and in the United States interest, to leverage investments and expertise in critical technologies to help build and upgrade accelerator and detector facilities in the United States.

“(i) ACCELERATOR AND DETECTOR RESEARCH AND DEVELOPMENT.—As part of the program described in subsection (a), the Director shall carry out research and development in advanced accelerator and detector concepts and technologies, including laser technologies, to reduce the necessary size and cost for the next generation of particle accelerators, in coordination with the Office of Science’s Basic Energy Sciences and Nuclear Physics programs as well as other relevant Federal agencies.

“(j) UNDERGROUND SCIENCE.—The Director shall—

“(1) support an underground science program consistent with the missions of the Department and the scientific needs of the High Energy Physics program, including those articulated in the most recent report of the Particle Physics Project Prioritization Panel of the High Energy Physics Advisory Panel, that leverages the capabilities of relevant underground science and engineering facilities; and

“(2) carry out a competitive grant program to award scientists and engineers at institutions of higher education, nonprofit institutions, and national laboratories to conduct research in underground science and engineering.

“(k) WORKFORCE DEVELOPMENT.—The Director of the Office of High Energy Physics shall support the development of a high energy physics workforce



through programs that facilitate collaboration between K–12 and university students and the National Laboratories, including through the use of proven techniques to expand the number of individuals from underrepresented groups pursuing and attaining skills or undergraduate and graduate degrees relevant to the Office’s mission.

“(1) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Secretary to carry out the activities described in this section—

【“(1) [\$\_\_ for fiscal year 2021; etc.”.】】

## SEC. 8. NUCLEAR PHYSICS PROGRAM.

(a) PROGRAM.—Section 308 of the Department of Energy Research and Innovation Act (42 U.S.C. 18641) is amended—

(1) by redesignating subsections (a) and (b) as subsections (b) and (c), respectively; and

(2) by inserting the following before subsection (b), as so redesignated:

“(a) PROGRAM.—As part of the activities authorized under section 209 of the Department of Energy Organization Act (42 U.S.C. 7139), the Director shall carry out a research program, and support relevant facilities, to discover and understand various forms of nuclear matter.”.

(b) ISOTOPE DEVELOPMENT AND PRODUCTION FOR RESEARCH APPLICATIONS.—Section 308(b)(1) of the Department of Energy Research and Innovation Act (42 U.S.C. 18646(a)(1)), as redesignated under subsection (a), is amended to read as follows:

“(1) shall carry out a program for the production of isotopes, including the development of techniques to produce isotopes, that the Secretary determines are needed for research, medical, industrial, or related purposes, in accordance with the 2015 NSAC ‘Meeting Isotope Needs and Capturing Opportunities For The Future’ report; and”.

(c) PROGRAM ADMINISTRATION.—Section 308 of the Department of Energy Research and Innovation Act (42 U.S.C. 18646) is amended by adding at the end the following:

“(d) USER FACILITIES.—

“(1) FACILITY FOR RARE ISOTOPE BEAMS.—

“(A) IN GENERAL.—The Secretary shall support construction of a Facility for Rare Isotope Beams to advance the understanding of rare nuclear isotopes and the evolution of the cosmos.

“(B) START OF OPERATIONS.—The Secretary shall, to the maximum extent practicable, ensure that the start of full operations of the facility under this subsection occurs before June 30, 2022.

“(C) FUNDING.—Out of funds authorized to be appropriated under subsection (f), there shall be made available to the Secretary to carry out construction of the facility under this subsection—

[ \_\_ for fiscal year \_\_ ]

“(2) ELECTRON-ION COLLIDER.—

“(A) IN GENERAL.—The Secretary shall support construction of an Electron Ion Collider as described in the 2015 Long Range Plan of the Nuclear Science Advisory Committee and the report from the National Academies titled ‘An Assessment of U.S.-Based Electron-Ion Collider Science’, in order to measure the internal structure of the proton and the nucleus and answer fundamental questions about the nature of visible matter.

“(B) START OF OPERATIONS.—The Secretary shall, to the maximum extent practicable, ensure that the start of full operations of the facility under this section occurs before December 31, 2030.

“(e) WORKFORCE DEVELOPMENT.—The Director of the Office of Nuclear Physics shall support the development of a nuclear science workforce through programs that facilitate collaboration between K–12 and university students and the National Laboratories, including through the use of proven techniques to expand the number of individuals from underrepresented groups pursuing and attaining skills or undergraduate and graduate degrees relevant to the Office’s mission.

“(f) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Secretary to carry out the activities described in this section—

“(1) [\$\_ for fiscal year 2021; etc.”.]

## SEC. 9. SCIENCE LABORATORIES INFRASTRUCTURE PROGRAM.

(a) PROGRAM.—Section 309 of the Department of Energy Research and Innovation Act (42 U.S.C. 18641) is amended by adding at the end the following:

“(c) APPROACH.—In carrying out this section, the Director shall utilize all available approaches and mechanisms, including capital line items, minor construction projects, energy savings performance contracts, utility energy service contracts, and alternative financing, as appropriate.

“(d) ALTERNATIVE FINANCING OF RESEARCH FACILITIES AND INFRASTRUCTURE.—

“(1) IN GENERAL.—Consistent with Section 161(g) of the Atomic Energy Act of 1954 (42 USC 2201(g)), the Management and Operating contractors of the Department may enter into the lease-purchase of research facilities and infrastructure under the scope of their contract with the Department with the approval of the Secretary or their designee.

“(2) LIMITATIONS.—To carry out lease-purchases approved by the Secretary under subsection (a), the Department shall only be required to have budget authority in an amount sufficient to cover the minimum required lease payments through the period required to exercise a termination provision in the lease agreement, plus any associated lease termination penalties, regardless of whether such leased facility and infrastructure is on or off Government land, and if—

“(A) the Department has established a mission need for the facility or infrastructure to be leased;

“(B) the facility or infrastructure is general purpose, including offices, laboratories, cafeterias, utilities, and data centers;

“(C) the Department is not a party to and has no financial obligations under the lease-purchase transaction entered into by the

Management and Operating contractor, other than allowability of the lease cost and conveyance of Government land, if needed;

“(D) the lease-purchase has an advance notice termination provision with reasonable pre-defined penalties that the Management and Operating contractor may exercise, at the direction of the Department, if funding for the lease is no longer available or the mission need ceases to exist;

“(E) There is an option for a no cost transfer of ownership to the Government once the underlying financing is retired, but neither the Management and Operating contractor nor the Department are obligated to purchase the facility or infrastructure at any time during or after the lease term;

“(F) the lease-purchase transaction, assuming exercise of the ownership option, is demonstrated to be the lowest lifecycle cost alternative for the Government; and

“(G) the cumulative annual base rent for all lease-purchases of facilities and infrastructure, inclusive of any transactions under consideration, does not exceed 2 percent of the Management and Operating contract operating budget for the year the commitment is made for the lease.

“(3) REPORTING.—Not later than one year after the date of the enactment of this Act, and biennially thereafter, the Department shall submit to the Committee on Science, Space, and Technology and the Committee on Appropriations of the House of Representatives, and the Committee on Energy and Natural Resources and the Committee on Appropriations of the Senate, a report on the lease-purchase transactions that the Management and Operating contractors of the Department entered into under subsection (a) that includes—

“(A) a list of the lease-purchase transactions entered into by each Management and Operating contractor and their respective costs;

“(B) the annual percentage of each Management and Operating contract operating budget that is used for lease-purchase transactions for the year the commitments were made; and

“(C) any other information the Secretary finds appropriate.

“(d) MID-SCALE INSTRUMENTATION PROGRAM.—The Director shall establish a mid-scale instrumentation program to enable the development and acquisition of novel, state-of-the-art instruments that would significantly accelerate scientific breakthroughs at national laboratory.

“(e) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Secretary to carry out the activities described in this section \$500 million for each of fiscal years 2021 through 2025.”.

#### SEC. 10. HIGH INTENSITY LASER RESEARCH INITIATIVE; WORKFORCE DEVELOPMENT FOR TEACHERS AND SCIENTISTS.

(a) IN GENERAL.—The Department of Energy Research and Innovation Act is amended by adding at the end the following:

##### “SEC. 310. HIGH INTENSITY LASER RESEARCH INITIATIVE.

“(a) IN GENERAL.—The Director shall establish a high intensity laser research initiative consistent with the recommendations of the National Academies report, ‘Opportunities in Intense Ultrafast Lasers: Reaching for the Brightest Light’, and the Brightest Light Initiative workshop report from the National Academies. This initiative should include research and development of petawatt-scale laser technologies necessary for future facility needs in discovery science and to advance energy technologies, as well as support for a user network of academic and national laboratory high intensity laser facilities.

“(b) COORDINATION.—The Director shall coordinate this initiative among all relevant programs within the Office of Science, and the Under Secretary shall coordinate this initiative with other relevant programs within the Department as well as within other Federal agencies.

##### “SEC. 311. WORKFORCE DEVELOPMENT FOR TEACHERS AND SCIENTISTS.

“(a) IN GENERAL.—The Secretary, in collaboration with the Director of the National Science Foundation, shall identify opportunities to support and leverage the National Science Foundation Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science National Network, hereafter referred to as the NSF INCLUDES National Network, to expand the number of students from underrepresented groups pursuing and

attaining undergraduate and graduate degrees in science, technology, engineering, and mathematics fields relevant to the Department’s mission.

“(b) PLAN.—Not later than 1 year after the date of 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 and the Committee on Commerce, Science, and Transportation of the Senate and make available to the public a plan for supporting and leveraging the National Science Foundation INCLUDES National Network.

“SEC. 312. AUTHORIZATION OF APPROPRIATIONS.

“For the activities of the Department of Energy Office of Science, there are authorized to be appropriated—[\_\_ for fiscal year \_\_, etc.]”.

(b) TABLE OF CONTENTS.—Section 1(b) of the Department of Energy Research and Innovation Act is amended in the table of contents by inserting after the item relating to section 309 the following:

“Sec. 310. High intensity laser research initiative

“Sec. 311. Workforce development for teachers and scientists

“Sec. 312. Authorization of appropriations”.

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