CHIPS and Science Act of 2022
Section-by-Section Summary

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DIVISION A - CHIPS ACT OF 2022

Sec. 101—Short title.
This Act may be cited as the "CHIPS Act of 2022."

Sec. 102—Creating helpful incentives to produce semiconductors (CHIPS) for America fund.
In order to support the rapid implementation of the semiconductor provisions included in the Fiscal Year ("FY") 2021 National Defense Authorization Act ("NDAA"), this division would provide $52.7 billion in emergency supplemental appropriations. The language would also re-affirm that the purchase of stocks and dividends are not an eligible use of CHIPS funds as determined by the eligible use of funds already required under the FY21 NDAA.
Funded activities include:

- $50.0 billion allocated over 5 years for a CHIPS for America Fund. Funding must be used to implement the Commerce Department semiconductor incentive—to develop domestic manufacturing capability—and research and development ("R&D") and workforce development programs authorized by the FY21 NDAA (Sec. 9902 & 9906). Each fiscal year, up to 2 percent of funds are made available for salaries and expenses, administration, and oversight, of which $5 million is available each year for the inspector general.

  Within the fund, the following appropriations are available:
  - Incentive Program: $39 billion allocated over 5 years to implement the programs authorized in Sec. 9902, of which $2 billion is explicitly provided to focus solely on legacy chip production to advance economic and national security interests. These chips are essential to the auto industry, the military, and other critical industries. Within the incentive program, up to $6 billion may be used for the cost of direct loans and loan guarantees.
    - $19 billion in FY22, including the $2 billion legacy chip production funding.
    - $5 billion each year, FY23 through FY26
  - Commerce R&D and workforce development programs: $11 billion appropriated over 5 years to implement programs authorized in Sec. 9906, including the National Semiconductor Technology Center ("NSTC"), the National Advanced Packaging Manufacturing Program, and other R&D and workforce development programs authorized in Sec. 9906.
    - $5 billion in FY22
      - $2 billion for NSTC
      - $2.5 billion for advanced packaging
      - $500 million for other related R&D programs
    - For use across the NSTC, advanced packaging, and other related R&D programs, the following would be provided:
      - $2 billion in FY23
      - $1.3 billion in FY24
      - $1.1 billion in FY25
      - $1.6 billion in FY26
- $2 billion for a CHIPS for America Defense Fund: Funding would be appropriated for the Microelectronics Commons, a national network for onshore, university-based prototyping, lab-to-fab transition of semiconductor technologies—including Department of Defense-unique applications—and semiconductor workforce training.

- $500 million for a CHIPS for America International Technology Security and Innovation Fund: Funding would be allocated over 5 years to the Department of State, in coordination with the U.S. Agency for International Development, the Export-Import Bank, and the U.S. International Development Finance Corporation, for the purposes of coordinating with foreign government partners to support international information and communications technology security and semiconductor supply chain activities, including supporting the development and adoption of secure and trusted telecommunications technologies, semiconductors, and other emerging technologies.
- $200 million for a Creating Helpful Incentives to Produce Semiconductors (CHIPS) for America Workforce and Education Fund: Funding provided to the National Science Foundation, spread over five years, to promote growth of the semiconductor workforce. A highly skilled domestic workforce is vital to the success of new and expanded facilities created through the CHIPS Act incentives. The semiconductor industry is projected to need an additional 90,000 workers by 2025.

Sec. 103—Semiconductor incentives.
Amends the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 (Public Law 116-283) to—

1) Clarify the eligibility of upstream suppliers, essential to building strong domestic semiconductor manufacturing ecosystems, to receive CHIPS funding;
2) Ensure, in the provision of incentives for semiconductor manufacturing, consideration of a broad range of semiconductors and the relevance of the technology to supply chain vulnerabilities;
3) Authorize $2 billion in additional financial incentives for manufacturing of mature technology nodes, with priority for critical manufacturing industries, such as the automotive industry;
4) Provide the Department of Commerce with other transaction authority to enable efficient execution of CHIPS awards; and
5) Require that construction projects funded under the CHIPS Act are subject to Section 602 of the Public Works and Economic Development Act of 1965 (42 U.S.C. 3212).

Prohibit the recipients of Federal incentive funds from expanding or building new manufacturing capacity for certain advanced semiconductors in specific countries that present a national security threat to the United States. To ensure that these restrictions remain current with the status of semiconductor technology and with U.S. export control regulations, the Secretary of Commerce, in coordination with the Secretary of Defense and the Director of National Intelligence, would be required to regularly reconsider, with industry input, which technologies are subject to this prohibition.

Sec. 104—Opportunity and Inclusion
Requires the Department of Commerce to establish activities and assign personnel to ensure that the recipients of CHIPS manufacturing incentives meet their commitments to increase the participation of economically disadvantaged individuals in the semiconductor workforce. Such personnel would also serve as a resource to support the participation of minority-owned businesses, veteran-owned businesses, and women-owned businesses, in CHIPS-funded projects.

Sec. 105—Additional GAO reporting requirements.
Expands the scope of the Government Accountability Office report already required under the FY21 NDAA to include an evaluation of potential Government steps to avoid semiconductor shortages; to

describe efforts taken to hire individuals from disadvantaged populations into the semiconductor workforce; and to detail how funded projects support the needs of critical infrastructure industries.

Sec. 106—Appropriations for wireless supply chain innovation.
Appropriates $1.5 billion for the Public Wireless Supply Chain Innovation Fund, to spur movement towards open-architecture, software-based wireless technologies, funding innovative, 'leap-ahead' technologies in the U.S. mobile broadband market. The fund would be managed by the National Telecommunications and Information Administration (NTIA), with input from the National Institute of Standards and Technology, Department of Homeland Security, and the Intelligence Advanced Research Projects Activity, among others.

Sec. 107—Advanced manufacturing investment credit.
Creates a 25 percent investment tax credit for investments in semiconductor manufacturing and includes incentives for the manufacturing of semiconductors, as well as for the manufacturing of the specialized tooling equipment required in the semiconductor manufacturing process. Taxpayers may elect to treat the credit as a payment against tax ("direct pay").
The credit is provided for property that is placed in service after December 31, 2022, and for which construction begins before January 1, 2027.

DIVISION B - RESEARCH & INNOVATION

TITLE I – DEPARTMENT OF ENERGY SCIENCE FOR THE FUTURE

Sec. 10101. Mission of the Office of Science.
Amends the Department of Energy Organization Act (42 U.S.C. 7139) by authorizing the Director of the Office of Science to carry out the construction, operation, and maintenance of user facilities to support the mission of the Office of Science. Authorizes the Secretary of Energy to coordinate the activities of the Office of Science with other offices of the Department and other federal agencies—for the purpose of enabling development of mission-relevant technologies. Requires all Office of Science programs to complete a future planning roadmap consistent with this Act.

Sec. 10102. Basic Energy Sciences Program.
Subsection (a) amends the Department of Energy Research and Innovation Act (42 U.S.C. 18641) by authorizing a research and development program in basic energy sciences, including materials sciences and engineering, chemical sciences, physical biosciences, geosciences, and other disciplines to provide the foundations for new energy technologies. This subsection authorizes sustainable chemistry research, as well as upgrades and related improvements to multiple user facilities, including: the Advanced Photon Source; the Spallation Neutron Source; the Advanced Light Source; the Linac Coherent Light Source II; the Cryomodule Repair and Maintenance Facility; the Nanoscale Science Research Center; and the National Synchrotron Light Source II. This subsection also authorizes computational material and chemical sciences research and development, including up to six centers. It authorizes development of a materials research database. This subsection authorizes: $2,685,414,000 for fiscal year (FY) 2023; $2,866,890,840 for FY 2024; $2,987,727,170 for FY 2025; $3,062,732,781 for FY 2026; and $3,080,067,167 for FY 2027 for the Basic Energy Sciences Program.

Subsection (b) amends section 973 of the Energy Policy Act of 2005 (42 U.S.C. 16313) by authorizing $50,000,000 per year for FY 2023 through FY 2027 to support basic research in artificial photosynthesis and $50,000,000 per year for FY 2023 through FY 2027 to support basic research in biochemistry, replication of natural photosynthesis, and related processes. It removes the existing statutory prohibition on the use of funds for commercial application of energy technology.

Subsection (c) amends section 975 of the Energy Policy Act of 2005 (42 U.S.C. 16315) by authorizing basic research and development activities to ensure U.S. competitiveness in energy storage. This subsection authorizes $50,000,000 per year for FY 2023 through FY 2027 to support basic research in multivalent ion materials in electric energy storage systems, $50,000,000 per year for FY 2023 through FY 2027 to support electrochemistry modeling and simulation, and $20,000,000 per year for FY 2023 through FY 2027 to support mesoscale electrochemistry. It removes the existing statutory prohibition on the use of funds for commercial application of energy technology.

Subsection (d) authorizes the Director of the Office of Science to support a program of basic research and development to bridge scientific barriers to expand knowledge relevant to nuclear matter for the benefit of commerce, medicine, and national security. This subsection authorizes $50,000,000 for each FY 2023 through FY 2027.

Subsection (e) establishes a “Carbon Materials Research Initiative” to expand fundamental knowledge of coal, coal-wastes, and carbon ore chemistry which includes a basic research program and the establishment of a research center in each of the two major coal-producing regions of the United States.

Subsection (f) establishes a "Carbon Sequestration Research and Geologic Computational Science Initiative" to expand fundamental knowledge, data collection, data analysis, and modeling of subsurface geology to advance understanding of carbon sequestration in geologic formations. Includes a basic research program.

Subsection (g) establishes at least two carbon storage research and geologic computational science centers to improve data collection, analysis, and modeling of subsurface geology to advance carbon sequestration in geologic formations.

Subsection (h) authorizes $50,000,000 per year for FY 2023 through FY 2027 to carry out the carbon research provisions in subsections (e) through (g).

Sec. 10103. Biological and Environmental Research.
Subsection (a) amends section 306 of the Department of Energy Research and Innovation Act (42 U.S.C. 18644) by authorizing a research and development program in biological systems science and climate and environment science relevant to the development of new energy technologies for the energy, environment, and national security missions of the Department. The subsection authorizes biological systems activities in genomic science, including fundamental research on plants and microbes, and biomolecular characterization and imaging science.

Subsection (b) amends section 306(e)(8) of the Department of Energy Research and Innovation Act (42 U.S.C. 18644(e)(8)) by authorizing $50,000,000 per year for FY 2026 and FY 2027 for the Low-Dose Radiation Research Program.

Subsection (c) directs the Secretary to carry out a basic research program on the similarities and differences between the effects of exposure to low-dose radiation on Earth, in low Earth orbit, and in the space environment, in coordination with the Administrator of the National Aeronautics and Space Administration.

Subsection (d) amends section 306 of the Department of Energy Research and Innovation Act (42 U.S.C. 18644) by authorizing the Director of the Office of Science to carry out earth and environmental systems science research in consultation with the National Oceanic and Atmospheric Administration (NOAA) and other federal agencies carrying out earth and environmental systems science research. It also directs 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, including a microbial molecular phenotyping capability, and to carry out a research program, in consultation with NOAA and other federal agencies, to enhance the understanding of littoral ecosystems. The subsection also directs the Secretary to establish an initiative focused on the development of engineered ecosystems within the Biological and Environmental Research program. The subsection authorizes: $885,420,000 for FY 2023; $946,745,200 for FY 2024; $1,001, 149,912 for FY 2025; $1,068,818,907 for FY 2026; and $1,129,948,041 for FY 2027 for the Biological and Environmental Research Program.

Subsection (e) authorizes up to six bioenergy research centers to conduct fundamental research in plant and microbial systems biology, biological imaging and analysis, and genomics, and to accelerate advanced research and development of advanced biofuels, bioenergy or biobased materials, chemicals, and products that are produced from a variety of regionally diverse feedstocks, and to facilitate the translation of research results to industry.

Sec. 10104. Advanced Scientific Computing Research Program.
Subsection (a) amends section 304 of the Department of Energy Research and Innovation Act (42 U.S.C. 18642) by authorizing a program to steward applied mathematics, computational science, and computer science research relevant to the mission of the Department. Within that program the subsection includes provisions for applied mathematics and software development for high-end computing systems and computer sciences research, an advanced computing program, guidance on mitigation of bias in high-performance computing capabilities, architectural research in heterogeneous computing systems, an energy efficient computing program, and upgrades to the energy science network user facility.

Subsection (a) also authorizes a computational science graduate fellowship program.

Subsection (a) authorizes: $1,126,950,000 for FY 2023; $1,194,109,500 for FY 2024; $1,265,275,695 for FY 2025; $1,340,687,843 for FY 2026; and $1,420,599,500 for FY 2027 for the Advanced Scientific Computing Research Program.

Subsection (b) authorizes a research, development, and demonstration program to accelerate innovation to support quantum network infrastructure and authorizes $100,000,000 per year for FY 2023 through FY 2027 for this program. It also directs the Secretary to establish a Quantum User Expansion for Science and Technology program (QUEST) to encourage and facilitate access to the United States quantum computing hardware and clouds for research purposes. The subsection authorizes: $30,000,000 for FY 2023; $31,500,000 for FY 2024; $33,075,000 for FY 2025; $34,728,750 for FY 2026; and $36,465,188 for FY 2027 for the QUEST program.

Sec. 10105. Fusion Energy Research.
Subsection (a) amends section 307 of the Department of Energy Research and Innovation Act (42 U.S.C. 18645) by authorizing $50,000,000 per year for FY 2023 through FY 2027 for research and development of fusion materials. It extends the authorization for inertial fusion research and development, alternative and enabling concepts, and the milestone-based development program through FY 2027. It authorizes the establishment of at least two national teams to develop conceptual designs and technology roadmaps for a pilot fusion plant, and authorizes $35,000,000 for FY 2023; $50,000,000 for FY 2024; $65,000,000 for FY 2025; $80,000,000 for FY 2026; and $80,000,000 for FY 2027 for these activities. It directs the Secretary to establish a high-performance computation collaborative research program and an associated innovation center in high-performance computing for fusion. It directs the construction of the Material Plasma Exposure Experiment including $21,895,000 for FY 2023 and $3,800,000 for FY 2024 to carry out the project. The subsection also authorizes an upgrade to the Matter in Extreme Conditions endstation at the Linac Coherent Light Source.

Subsection (a) authorizes a total of $1,025,500,400 for FY 2023; $1,043,489,724 for FY 2024; $1,053,266,107 for FY 2025; $1,047,962,074 for FY 2026; and $1,114,187,798 for FY 2027 for the Fusion Energy Sciences Program.

Subsection (b) amends section 972 of the Energy Policy Act of 2005 (42 U.S.C. 16312) by authorizing $379,700,000 for FY 2023; $419,250,000 for FY 2024; $415,000,000 for FY 2025; $370,500,000 for FY 2026; and $411,078,000 for FY 2027 for construction of the ITER international fusion project.

Sec. 10106. High Energy Physics Program.
Subsection (a) amends section 305 of the Department of Energy Research and Innovation Act (42 U.S.C. 18643) by authorizing a research program in elementary particle physics and associated advanced technology research and development to improve the understanding of the fundamental properties of the universe, including constituents of matter and energy and the nature of space and time.

Subsection (b) amends section 305(d) of the Department of Energy Research and Innovation Act (42 U.S.C. 18634(d)) by authorizing the Director of the Office of Science to ensure the participation of the United States in international efforts related to the Large Hadron Collider, encourage international participation in the Long-Baseline Neutrino Facility and Deep Underground Neutrino Experiment, and prioritize engagement in future international facilities.

Subsection (c) amends section 305(f) of the Department of Energy Research and Innovation Act (42 U.S.C. 18645(f)) by authorizing research to understand the nature of the universe and authorizes collaboration with other federal agencies and international partners.

Subsection (d) amends section 305 of the Department of Energy Research and Innovation Act (42 U.S.C. 18645) by authorizing the construction of major facilities and items of equipment, including: the Long-Baseline Neutrino Facility; the Proton Improvement Plan-II Accelerator Upgrade; and the Cosmic Microwave Background Stage 4 project. It also authorizes accelerator and detector upgrades and research and development, and a program to conduct scientific research in underground facilities.

Subsection (d) authorizes: $1,159,520,000 for FY 2023; $1,289,891,200 for FY 2024; $1,428,284,672 for FY 2025; $1,499,881,752 for FY 2026; and $1,554,874,657 for FY 2027 for the High Energy Physics Program.

Sec. 10107. Nuclear Physics Program.
Amends section 308 of the Department of Energy Research and Innovation Act (42 U.S.C. 18646) by authorizing a research program to discover and understand various forms of nuclear matter. It authorizes construction of the Electron-Ion Collider, including: $90,000,000 for FY 2023; $181,000,000 for FY 2024; $219,000,000 for FY 2025; $297,000,000 for FY 2026; and $301,000,000 for FY 2027. The subsection authorizes: $840,480,000 for FY 2023; $976,508,800 for FY 2024; $1,062,239,328 for FY 2025; $1,190,838,688 for FY 2026; and $1,248,463,709 for FY 2027 for the Nuclear Physics Program.

Sec. 10108. Science Laboratories Infrastructure Program.
Amends section 309 of the Department of Energy Research and Innovation Act (42 U.S.C. 18647) by authorizing the Director of the Office of Science to employ all available approaches and funding mechanisms to address science laboratory infrastructure needs. It directs the Secretary to report annually on the list of projects for which the Secretary will provide funding, including a description of each project and the funding profile for the project. The section authorizes $550,000,000 per year for FY 2023 through FY 2027 for the Science Laboratory Infrastructure Program.

Sec. 10109. Accelerator Research and Development.
Amends the Department of Energy Research and Innovation Act (42 U.S.C. 18601 et seq.) by authorizing a program to advance particle accelerator science and technology of relevance to the mission of the Department; foster partnerships to develop, demonstrate, and enable the commercial application of such technologies; support associated workforce development activities; and provide access to accelerator design and engineering resources. The section authorizes: $19,080,000 for FY 2023; $20,224,800 for FY 2024; $21,438,288 for FY 2025; $22,724,585 for FY 2026; and $24,088,060 for FY 2027.

Sec. 10110. Isotope Research, Development, and Production.
Subsection (a) amends the Department of Energy Research and Innovation Act (42 U.S.C. 18601 et seq.) by authorizing a program to produce isotopes that are needed and of sufficient quality for research, medical, industrial, and related purposes. It also advances isotope production methods and techniques by maintaining and enhancing associated infrastructure and conducting research into new production and processing techniques. This subsection authorizes the Director of the Office of Science to carry out activities to reduce dependence on the foreign supply of critical radioactive and stable isotopes, and

ensure that the program does not interfere with private sector efforts to produce isotopes. It authorizes the establishment of an Isotope Program Advisory Committee and requires reports for meeting the nation's isotope needs. The subsection authorizes: $175,708,000 for FY 2023; $196,056,480 for FY 2024; $215,759,869 for FY 2025; $200,633,461 for FY 2026; and $146,293,469 for FY 2027.

Subsection (b) amends section 952(a) of the Energy Policy Act of 2005 (42 U.S.C. 16272(a)) by requiring the Secretary to evaluate the technical and economic feasibility of establishing an isotope demonstration program to support the development and commercial demonstration of critical radioactive and stable isotope production in existing commercial nuclear power plants.

Subsection (c) authorizes the constructions of a radioisotope processing facility to provide for the growing radiochemical processing capability needs associated with the production of critical radioactive isotopes. The subsection authorizes $30,500,000 for FY 2023; $75,000,000 for FY 2024; $105,000,000 for FY 2025; $83,000,000 for FY 2026; and $43,000,000 for FY 2027.

Subsection (d) authorizes the establishment of a stable isotope production and research center to expand the ability of the United States to perform multiple stable isotope production campaigns at large-scale production, as authorized under section 311 of the Department of Energy Research and Innovation Act. The subsection authorizes $74,400,000 for FY 2023; $46,000,000 for FY2024; $31,200,000 for FY 2025; $33,300,000 for FY 2026; and $13,900,000 for FY 2027.

Sec. 10111. Increased Collaboration with Teachers and Scientists.
Subsection (a) amends the Department of Energy Research and Innovation Act (42 U.S.C. 18601 et seq.) by authorizing the Director of the Office of Science to support the development of a scientific workforce. It authorizes programs that foster collaboration between teachers at elementary schools and secondary schools, students and faculty at institutions of higher education, early-career researchers, and the National Laboratories. Authorizes 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 mission of the Office of Science.

Subsection (b) authorizes $40,000,000 per year for FY 2023 through FY 2027 to support the activities authorized.

Subsection (c) amends the Department of Energy Science Education Enhancement Act by authorizing the Secretary to expand opportunities to increase the number of highly skilled science, technology, engineering, and mathematics (STEM) professionals working in disciplines relevant to the mission of the Department, including by broadening the recruitment pool to increase participation of underrepresented groups. The Secretary is further directed to report to Congress on the Department's plan associated with this authorization. Of the funds authorized, not less than $2,000,000 per year is authorized to carry out these activities.

Sec. 10112. High intensity laser research initiative; Helium conservation program; Office of Science Emerging Biological Threat Preparedness Research Initiative; Midscale Instrumentation and Research Equipment Program; Authorization of Appropriations.
Amends the Department of Energy Research and Innovation Act (42 U.S.C. 18601 et seq.) (as amended by section 12(a) of the bill) by adding the following sections:

Sec. 313 authorizes the Director of the Office of Science to establish a high intensity laser research initiative. The subsection authorizes $50,000,000 for FY 2023; $100,000,000 for FY 2024; $150,000,000 for FY 2025; $200,000,000 for FY 2026; and $250,000,000 for FY 2027.

Sec. 314 authorizes the Secretary to establish a program to reduce the consumption of helium for Department grant recipients and facilities and encourage helium recycling and reuse.

Sec. 315 authorizes the Secretary to establish a cross-cutting research initiative, to be known as the 'Biological Threat Preparedness Research Initiative', to aid efforts to prevent, prepare for, predict, and respond to natural and anthropogenic biological threats to national security. It authorizes the Secretary to leverage the innovative analytical resources and tools, user facilities, and advanced computational and networking capabilities of the Department as necessary for the purposes of this initiative. Authorizes $50,000,000 per year for FY 2023 through FY 2027

Sec. 316 authorizes the Director of the Office of Science to establish a midscale instrumentation and research equipment program to develop, acquire, and commercialize research instrumentation and equipment in the $1,000,000 to $20,000,000 range needed to meet the Department's mission and to provide platform technologies for the broader scientific community. Authorizes $150,000,000 per year for FY 2023 through FY 2027.

Sec. 317 authorizes $8,902,392,400 for FY 2023; $9,541,895,744 for FY 2024; $10,068,198,994 for FY 2025; $10,468,916,520 for FY 2026; and $10,831,342,317 for FY 2027 for the Office of Science.

Sec. 10113. Established Program to Stimulate Competitive Research (EPSCoR).
Amends section 2203(b)(3) of the Energy Policy Act of 1992 (42 U.S.C. 3503(b)(3)) to expand DOE's EPSCoR program and improve its integration with Office of Science programs. It expands activities to improve the research capacity and capabilities at universities in EPSCoR states, including with scholarships and fellowships, grants for early career faculty, and funding to institutions to support collaboration and expertise-building. The section authorizes: $50,000,000 for FY 2023; $50,000,000 for FY 2024; $75,000,000 for FY 2025; $100,000,000 for FY 2026; and $100,000,000 for FY 2027 to support the activities authorized. Authorizes $25,000,000 per year for FY 2023 through FY 2027 for research instrumentation and equipment that range in cost from $500,000 to $20,000,000.

Requires that not less than 10 percent of the university research and developments funds awarded by the Office of Science be awarded to institutions in EPSCoR states to further enhance their participation in and contributions to Office of Science programs. To further improve coordination, the Undersecretary for Science is directed to ensure robust participation of representatives from EPSCoR universities on Office of Science Advisory Committees. The Department is required to submit to the appropriate committees of Congress its plan for implementing the activities authorized and to provide an annual evaluation report.

Sec. 10114. Research Security.
Directs the Secretary to develop and maintain tools and processes to manage and mitigate research security risks with associated with any research, development, demonstration, or deployment activities authorized under this Act, such as a science and technology risk matrix, informed by threats identified by the Director of the Office of Intelligence and Counterintelligence, to facilitate determinations of the risk of loss of United States intellectual property or threat to the national security of the United States. It also imposes penalties on funding recipients which knowingly violate the protocols established to mitigate research security risks. This provision is limited to the Office of Science.

TITLE II – NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY FOR THE FUTURE ACT

SUBTITLE A – APPROPRIATIONS

Sec. 10211. Authorization of appropriations.
Authorizes $9.68 billion for the National Institute of Standards and Technology ("NIST") over five years, including $2.23 billion for the Hollings Manufacturing Extension Partnership and $829 million for the Manufacturing USA program.

SUBTITLE B – MEASUREMENT RESEARCH

Sec. 10221. Engineering biology and biometrology.
Authorizes and expands NIST's engineering biology, biomanufacturing, and biometrology research and development of tools and methodologies to measure the molecular components of the cell and engineered systems.

Sec. 10222. Greenhouse gas measurement research.
Authorizes and expands NIST's greenhouse gas measurement program, including support for testbeds and a Center for Greenhouse Gas Measurements, Standards, and Information.

Sec. 10223. NIST authority for cybersecurity and privacy activities.
Amends Section 2 of the NIST Act (15 U.S.C. 272) regarding the agency's cybersecurity and privacy program authorities, including with specific direction on software and cloud security and privacy enhancing technologies.

Sec. 10224. Software security and authentication.
Directs NIST to create guidance on the security of the full lifecycle of software and open-source software repositories, establish a program for artificial intelligence-enabled defense research, provide technical assistance to Federal inspectors general, and require NIST to digitally authenticate all software tools developed by the agency.

Sec. 10225. Digital identity management research.
Amends Section 504 of the Cybersecurity Enhancement Act of 2014 (15 U.S.C. 7464) to authorize NIST's digital identity research and require NIST to develop voluntary guidance for digital identity management.

Sec. 10226. Biometrics research and testing.
Expands NIST's biometrics identification research and testing program, to meet the growing of NIST biometrics program, including access to data - for evaluating the accuracy and bias of biometric technologies and directs the Government Accountability Office to study the impact of biometric systems on historically marginalized communities. It would further direct NIST to prioritize testing of biometrics technologies developed by U.S. entities.

Sec. 10227. Federal biometric performance standards.
Amends Section 20 of the National Institute of Standards and Technology Act (15 U.S.C. 278g-3) to direct NIST to develop performance standards and guidelines for high-risk Federal biometric identification systems.

Sec. 10228. Protecting research from cyber theft.
Amends Section 2 of the National Institute of Standards and Technology Act (15 U.S.C. 272(e)) to require NIST to consider the needs of institutions of higher education when creating cybersecurity guidance.

Sec. 10229. Dissemination of resources for research institutions.
Requires NIST to offer resources and technical assistance to research intensive universities to help them mitigate their cyber risks related to conducting research.

Sec. 10230. Advanced communications research.
Authorizes NIST's advanced communications research and test beds, including the existing National Advanced Spectrum Communications Test Network (NASCTN).

Sec. 10231. Neutron scattering.
Requires NIST to develop a strategic plan for the future of the NIST Center for Neutron Research and to conduct the agency's neutron research in coordination with DOE.

Sec. 10232. Artificial intelligence.
Provides support for NIST's role in the development of safe and trustworthy artificial intelligence and data science, including amending Section 22A of the National Institute of Standards and Technology Act (15 U.S.C. 278h-1) to establish test beds.

Sec. 10233. Sustainable Chemistry Research and Education.
Requires NIST to conduct activities in support of sustainable chemistry.

Sec. 10234. Premise plumbing research.
Authorizes a research program to facilitate the development of metrology for premise plumbing.

Sec. 10235. Dr. David Satcher Cybersecurity Education Grant Program.
Authorizes a grant program to establish or expand cybersecurity programs for institutions of higher education that have a high enrollment of needy students, historically Black colleges and universities, Tribal colleges and universities, and minority serving institutions.

SUBTITLE C – GENERAL ACTIVITIES

Sec. 10241. Educational outreach and support for underrepresented communities.
Expands NIST's educational activities and outreach focused on underrepresented communities.

Sec. 10242. Other transactions authority.
Provides NIST more flexibility to partner with the private sector on research and development, especially for implementation of activities authorized and funded under Division A of this Act.

Sec. 10243. Report to congress on collaborations with government agencies.
Requires a report to be delivered to relevant Committees, within six months of enactment of this Act, describing challenges with respect to collaboration with other Federal agencies.

Sec. 10244. Hiring critical technical experts.
Provides NIST the authority to directly hire not more than 15 technical experts with increased salaries, to enable the agency to better acquire talent in critical technology areas.

Sec. 10245. International standards development.
Codifies NIST's role as a convener and Federal coordinator in international standard setting and expands NIST's support for standards capacity building, including through a pilot program for grants to small businesses, nonprofits, and universities to participate in international standards setting.

Sec. 10246. Standard technical update.
Provides several technical and administrative updates to the NIST Act.

Sec. 10247. GAO study on NIST research security policies and protocols.
Directs the Government Accountability Office to review NIST security practices to guard against foreign interference.

Sec. 10248. Standards development organization grants.
Directs NIST to establish a competitive grants program for nongovernmental standards organizations to develop, approve, disseminate, maintain and review forensic science voluntary consensus standards.

SUBTITLE D – HOLLINGS MANUFACTURING EXTENSION PARTNERSHIP

Sec. 10251. Establishment of expansion awards pilot program as a part of the Hollings Manufacturing Extension Partnership.
Establishes a pilot program of expansion awards for Hollings Manufacturing Extension Partnership (MEP) centers to provide services for workforce development (which may include training advanced manufacturing personnel), resiliency of domestic supply chains, and expanded support for adopting advanced technology upgrades at small and medium manufacturers. Awards can be used to connect manufacturers with services provided in their community, as is currently done by groups such as institutions of higher education, public private partnerships, State governments, and collections of entities and individuals. Awards could also be used to establish demonstration laboratories, to support the development of next-generation technologies that can be adopted by small- and medium-sized manufacturers.

Sec. 10252. Update to manufacturing extension partnership.
Amends Section 25 of the National Institute of Standards and Technology Act (15 U.S.C. 278k) to require MEP to increase outreach to underserved communities, allow NIST to accept funding from other Federal departments and agencies for competitive MEP grants, and ensure the MEP Centers are specifically focused on supporting American manufacturing.

Sec. 10253. National supply chain database.
Establishes a voluntary national supply chain database under MEP, as an integration of State-level databases, to assist the Federal Government and industry sectors in minimizing disruptions to United States' supply chains.

Sec. 10254. Hollings Manufacturing Extension Partnership activities.
Clarifies that businesses that participate in MEP may opt-in to automatic enrollment in GSA Advantage.

Sec. 10255. Amendment to the Hollings Manufacturing Extension Partnership relating to institutions of higher education.
Amends the MEP statute to include definitions used in this Act.

SUBTITLE E – MANUFACTURING USA PROGRAM

Sec. 10261. Supporting geographic diversity.
Requires an Agency head, when planning or establishing a Manufacturing USA program, to give consideration to geographic diversity, areas with low per capita income, areas with a high proportion of socially disadvantaged residents, or areas that are located in small and rural communities.

SEC. 10262. Expanding Opportunities through the Manufacturing USA Program.
Directs Federal agencies to increase participation of minority serving institutions, minority business enterprises, and rural-serving institutions in Manufacturing USA institutes.

Sec. 10263. Promoting domestic production of technologies developed under Manufacturing USA Program.
Requires an Agency head to establish policies to promote the domestic production of technologies developed by the Manufacturing USA Network.

TITLE III – NATIONAL SCIENCE FOUNDATION FOR THE FUTURE

SUBTITLE A – PRELIMINARY MATTERS

Sec. 10301. Sense of Congress.
Expresses the Sense of Congress that NSF, DOE, and other Federal agencies carry out vital basic and applied research, that increasing research and technology transfer investments will enhance the competitiveness of the United States, and that the nation benefits from building diverse geographic research capacity, utilizing the nation's full talent, remaining open to diverse perspectives, and maintaining bipartisan consensus on science funding.

Sec. 10302. Definitions.
Defines several terms used throughout the section.

Sec. 10303. Authorizations of appropriations.
Authorizes $81 billion for the National Science Foundation over five years, including for key activities such as research and related activities, STEM education, and major research equipment.

SUBTITLE B – STEM EDUCATION

Sec. 10311. PreK-12 STEM education.
Supports National Academies study on barriers to the widespread implementation of STEM education innovations. Supports research and development to improve informal STEM education. Establishes a ten-year National STEM Teacher Corps pilot program to recruit and retain high-quality STEM teachers to increase STEM student achievement and participation rates.

Sec. 10312. Undergraduate STEM education.
Supports research and development to improve the alignment of undergraduate STEM education and training with workforce needs. Updates the Advanced Technological Education program to establish a network of centers for science and technical education and supports research and development to improve STEM education at community colleges. Supports awards to advance research on effective STEM education practices at community colleges, provide students with hands-on training and research experiences, and support career and technical education in STEM fields. Establishes a pilot program to

develop and scale up successful models for providing students with hands-on course-based research experiences.

Sec. 10313. Graduate STEM education.
Expands requirement for funding proposals to include a mentoring plan for graduate students. Supports activities to facilitate career exploration for graduate students and postdoctoral researchers. Creates a requirement for funding proposals to include individual development plans for graduate students and postdoctoral researchers and provides supplemental funding to facilitate professional development activities. Supports research on the graduate education system. Updates the Graduate Research Fellowship Program to increase the number of new graduate fellows supported annually, address workforce demand, increase the cost of education allowance, and recruit a more diverse pool of applicants. Requires an evaluation of mechanisms for supporting graduate student education and training. Requires a report on the need and feasibility of a program to recruit and train the next generation of artificial intelligence professionals and authorizes NSF to establish a Federal AI scholarship-for-service program, which would run in addition to existing programs such as CyberCorps Scholarship-for-Service.

Sec. 10314. STEM workforce data.
Requires a portfolio analysis of Foundation investments in the skilled technical workforce. Requires an assessment of the feasibility and benefits of adding rotating questions/topic modules to existing National Center for Science and Engineering Statistics (NCSES) surveys. Requires an assessment of the feasibility and benefits of incorporating new questions to existing NCSES surveys on a range of topics related to the nature of the STEM workforce and the workforce environment. Requires a Government Accountability Office evaluation of the capacity of NCSES to meet current and future needs for data on the STEM workforce.

Sec. 10315. Cyber workforce development research and development.
Supports research on the cyber workforce, including paths to entry and re-entry into the cyber workforce.

Sec. 10316. Federal cyber scholarship-for-service program.
Clarifies that cybersecurity-related aspects of artificial intelligence, quantum computing, aerospace, and other fields are within the scope of the NSF CyberCorps Scholarship-for-Service program.

Sec. 10317. Cybersecurity workforce data initiative.
Establishes a data initiative through the NCSES to measure the cybersecurity workforce.

Sec. 10318. Microelectronics workforce development activities.
Directs the National Science Foundation to make awards, including through existing programs, supporting the development and expansion of microelectronics education and workforce development activities at all levels of education, including traineeships. Establishes a National Network for Microelectronics Education to enhance and broaden participation in microelectronics education in coordination with industry, led by a network coordination hub.

Sec. 10319. Incorporation of art and design into certain STEM education.
Supports research to develop STEM educational curriculums that incorporate art and design to promote creativity and innovation.

Sec. 10320. Mandatory cost-sharing.
Waives mandatory cost-sharing requirements for the Major Research Instrumentation and Robert Noyce Teacher Scholarship programs for 5 years.

Sec. 10321. Programs to address the STEM workforce.
Provides for scholarships, fellowships, traineeships, and postdoctoral awards, and authority for Federal research agencies to hire recipients of such awards.

SUBTITLE C – BROADENING PARTICIPATION

Sec. 10321. Presidential awards for excellence in mathematics and science teaching.
Updates the program to allow for the selection of at least one teacher each from the Commonwealth of the Northern Mariana Islands, American Samoa, the Virgin Islands of the United States, and Guam.

Sec. 10322. Robert Noyce Teacher Scholarship program update.
Requires outreach to historically Black colleges and universities, minority institutions, higher education programs that serve veterans and rural communities, labor organizations, and emerging research institutions.

Sec. 10323. NSF Eddie Bernice Johnson INCLUDES Initiative.
Codifies and renames the NSF INCLUDES program.

Sec. 10324. Broadening participation on major facilities awards.
Establishes a requirement for organizations seeking management awards to demonstrate experience and capabilities in employing best practices in broadening participation and directs the Foundation to consider implementation of such practices in oversight of the award.

Sec. 10325. Expanding geographic and institutional diversity in research.
Expresses the sense of Congress that the Foundation should continue to support research and education capacity building through the Established Program to Stimulate Competitive Research (EPSCoR) program.

Amends the America COMPETES Reauthorization Act of 2010 to direct Federal agencies administering an EPSCoR program to consider modifications to EPSCoR award structures to build the STEM education and workforce development capacity of rural communities.

Directs NSF to dedicate an increasing percentage of funds in key research and STEM accounts to institutions and local researchers in EPSCoR jurisdictions, beginning at 15.5% in fiscal year 2023 and increasing gradually up to 20% in fiscal year 2029, as practicable and consistent with merit-review. Directs NSF to report annually on implementation of the funding goals and assess the impact on EPSCoR eligibility and research capacity in EPSCoR jurisdictions and various research institution types across the country.

Supports research capacity building for research institutions not in the top 100 of Federal research funding, including support for developing and expanding research programs, faculty professional development, stipends for students, acquisition of research instrumentation, and administrative research support.

Establishes a pilot program to require multi-institution proposals seeking funding in excess of $1 million be submitted in partnership with emerging research institutions and requires annual reporting on such grants to include feedback directly from participating emerging research institutions.

Sec. 10326. Diversity in tech research.
Supports organizational research, including research on diversity, equity, and inclusion in the technology sector.

Sec. 10327. Chief Diversity Officer of the NSF.
Establishes a Chief Diversity Officer position charged with providing guidance and leading the Foundation's strategic planning to broaden diverse participation of individuals and institutions in NSF-funded activities.

Sec. 10328. Research and dissemination to increase the participation of women and underrepresented minorities in STEM fields.
Supports research and development activities to increase the participation of women and underrepresented minorities in STEM studies and careers, including research studies, mentoring programs, research experiences, and outreach to elementary and secondary school students

Sec. 10329. Activities to expand STEM opportunities.
Supports and incentivizes institutional reform efforts to expand opportunities and development for underrepresented minorities in STEM academic careers and undergraduate STEM studies, including the development and assessment of training courses for administrators – including University Presidents, Vice Presidents, Deans, and Department Chairs – and search committee members to ensure unbiased recruitment and evaluation of underrepresented minority candidates.

Sec. 10330. Intramural emerging research institutions pilot program.
Authorizes NSF to carry out multiple pilot programs to increase the number and diversity of institutions able to compete for Foundation research and development awards.

SUBTITLE D – RESEARCH SECURITY

Sec. 10331. Office of Research Security and Policy.
Establishes an Office of Research Security and Policy within the Foundation to consult and coordinate with the Foundation Office of Inspector General, other Federal research agencies, intelligence and law enforcement agencies, and the National Science and Technology Council to identify and address potential security risks that threaten research integrity and other risks to the research enterprise and to develop research security policy and best practices.

Sec. 10332. Chief of Research Security.
Establishes a Chief of Research Security position within the Office of the Director to manage the Office of Research Security and Policy.

Sec. 10333. Reporting to Congress.
Directs the Foundation to submit a report to Congress on the resource and staffing needs of the Office of Research Security and Policy and annually report to Congress on the activities carried out by the office.

Sec. 10334. Online resource.
Directs the Foundation to develop an online resource to inform institutions and researchers of security risks and best practices and explain Foundation research security policies.

Sec. 10335. Research awards.
Supports research on the research environment and factors related to misconduct.

Sec. 10336. Authorities.
Authorizes the Foundation to conduct proactive risk assessments using information contained in award proposals and related disclosures.

Sec. 10337. Responsible conduct in research training.
Expands the requirement for responsible conduct in research training to include faculty and other senior personnel on Foundation awards and expands the scope of such training to include mentoring training and training to raise awareness of research security risks as well as Federal export control, disclosure, and reporting requirements.

Sec. 10338 - Research security and integrity information sharing analysis organization.
Directs the Foundation to establish a research security and integrity information sharing analysis organization to enable the research community to share information, identify research security risks, and implement risk assessment and mitigation best practices.

Sec. 10339. Plan with respect to controlled information and background screening.
Directs the Foundation to develop a plan for identifying areas of research that may involve access to classified or controlled unclassified information and exercise due diligence processes in granting access to such information.

Sec. 10339A. Foundation funding to institutions hosting or supporting Confucius institutes.
Places restrictions on eligibility for Foundation research and development funding for institutions that host or support Confucius institutes.

Sec. 10339B. Foreign financial support.
Directs the Foundation to collect annual summaries of foreign financial support from universities and authorizes the Foundation to request copies of contracts or documentation related to such disclosures. The provision establishes a reporting threshold of $50,000 or more, including gifts and contracts, received directly or indirectly from a foreign source.

Sec. 10339C. Authorization of appropriations.
Directs the Foundation to allocate $6 million per year from 2023 through 2027 to fund activities under the Research Security subtitle.

SUBTITLE E – FUNDAMENTAL RESEARCH

*Sec. 10341. Broader impact*s.
Directs an assessment of the application of the Broader Impacts review criterion across the Foundation and provides support for activities to improve its implementation.

Sec. 10342. Sense of Congress.
Expresses the sense of Congress that the Foundation should continue to identify opportunities to reduce administrative burden on researchers.

Sec. 10343. Research ethics.
Expresses the sense of Congress with respect to potential ethical, social, safety, and security implications of research in emerging technologies. Establishes a requirement for the inclusion of an ethics statement in award proposals. Supports research on the ethical and social implications of Foundation-supported research and the development of approaches for risk mitigation.

Sec. 10344. Research reproducibility and replicability.
Establishes a requirement for the inclusion of a machine-readable data management plan in award proposals. Requires the development of a set of criteria for trusted open repositories and provides support for the development of open data repositories to address any gaps. Requires the establishment of a single web-based point of access for data, software, and code resulting from Foundation funded projects. Directs the Foundation to ensure that data resulting from Foundation-funded projects is made available in trusted open repositories. Supports research and development of tools and infrastructure to support research reproducibility.

*Sec. 10345. Climate change researc*h.
Supports research to improve understanding and predictability of the climate system and related human and environmental systems.

Sec. 10346. Social, behavioral, and economic sciences.
Directs the Foundation to take steps to ensure the participation of social, behavioral, and economic science researchers in cross-cutting and interdisciplinary agency programs.

Sec. 10347. Measuring impacts of Federally funded R&D.
Supports research related to understanding the impacts of Federally funded research and development on society, the economy, the workforce, and domestic job creation.

Sec. 10348. Food-energy-water research.
Supports research related to the food-energy-water system.

Sec. 10349. Biological field stations and marine laboratories.
Supports research instrumentation and other infrastructure at biological field stations and marine laboratories.

Sec. 10350 - Sustainable chemistry research and education.
Establishes a program to support research related to sustainable chemistry practices.

*Sec. 10351. Risk and resilience researc*h.
Supports research related to risk assessment and predictability and development of tools and technologies for increased societal resilience in the face of catastrophes like natural disasters.

Sec. 10352. Unmanned aircraft systems technologies.
Supports research and development related to unmanned aircraft systems technologies, in consultation with FAA and NASA.

Sec. 10353. Accelerating unmanned maritime systems technologies.
Supports research and development to accelerate innovation in unmanned maritime systems, in consultation with NOAA and the Coast Guard.

Sec. 10354. Leveraging international expertise in research.
Directs NSF to explore opportunities to support international research collaboration.

Sec. 10355. Biological research collections.
Supports databases and tools to secure and improve biological research collections. Establishes a requirement for the inclusion of a specimen management plan in award proposals. Supports coordination and data sharing for research and workforce training, including the establishment of an action center for biological collections.

Sec. 10356. Clean water research and technology acceleration.
Supports clean water system research, and related technology and workforce development.

Sec. 10357. Technology and behavioral science research.
Supports social and behavioral science research on the impact of social media and consumer technology on mental health, particularly on the health of children and adolescents.

Sec. 10358. Manufacturing research amendment.
Updates the list of technology areas eligible for funding through the NSF's advanced manufacturing research program to include additive and continuous manufacturing.

Sec. 10359. Critical minerals mining research and development.
Supports research and development to advance critical minerals mining strategies and technologies and facilitates interagency coordination by establishing a subcommittee of the National Science and Technology Council.

Sec. 10360. Study of AI research capacity.
Directs the Foundation to conduct or support a study, to be made publicly available, on artificial intelligence research capacity at U.S. universities, including what enables successful research in the field and the geographic diversity of successful research in the country.

Sec. 10361. Advancing IoT for Precision Agriculture Capabilities Act.
Supports research to improve the use of advanced sensing systems in rural and agricultural areas, highlights improving productivity in agriculture as a goal for activities funded under the Advanced Technological Education program and supports a Government Accountability Office technology assessment of precision agriculture technologies.

Sec. 10362. Astronomy and satellite constellations.
Supports research on the potential impact of satellite constellations on ground-based astronomy and the development of mitigation strategies.

Sec. 10363. Research on the impact of inflation.
Supports research on the effects of inflation, including on the American workforce and American competitiveness.

Sec. 10364. Microgravity utilization policy.
Directs the Foundation to facilitate access to the microgravity environment for recipients of Foundation awards, and requires a report to Congress on how the Foundation will facilitate such access.

Sec. 10365. Recognition of the Arecibo Observatory.
Finds that the Arecibo Observatory built in Puerto Rico in the 1960s contributed to radio astronomy before its collapse in 2020 and expresses the Sense of Congress commending NSF for exploring new ideas for future activities at the Arecibo Observatory.

SUBTITLE F – RESEARCH INFRASTRUCTURE

Sec. 10371. Facility operations and maintenance.
Requires the continuation of the Facility Operation Transition pilot program in the Facilities Construction account to provide cost sharing with the managing directorate during the first five years of operation.

Sec. 10372. Reviews.
Directs periodic assessment of the cost and benefits of extending the operation of research facilities beyond their planned operational lifespan.

Sec. 10373. Helium conservation.
Expands eligibility for the Major Research Instrumentation program to include the purchase, installation, operation, and maintenance of equipment and instrumentation to conserve helium.

Sec. 10374. Advanced computing.
Directs the Foundation to collect information and regularly publish a report on the computational needs for Foundation-funded projects. Directs the Foundation to develop and regularly update an advanced computing roadmap. Supports a secure computing enclave pilot program to assist universities in ensuring the security of data resulting from federally supported research. Authorizes $38 million for fiscal years 2023 through 2025 to carry out the pilot program.

Sec. 10375. National secure data service.
Establishes a National Secure Data Service demonstration project to test models and inform full implementation of a government-wide data linkage and access infrastructure, and authorizes $9 million for each of fiscal years 2023 through 2027 to carry out the section.

SUBTITLE G – DIRECTORATE FOR TECHNOLOGY, INNOVATION, AND PARTNERSHIPS

Sec. 10381. Establishment.
Establishes a new directorate to accelerate use-inspired and translational research and technology development to advance solutions to pressing societal challenges.

Sec. 10382. Purposes.
Explains that the purposes of the directorate are to support translational research, accelerate the development and use of federally funded research, strengthen U.S. competitiveness through development of key technologies, and expand student and researcher participation and the U.S. workforce in key technologies and in areas of societal, national, and geostrategic importance.

Sec. 10383. Activities.
Describes activities to be supported by the directorate, including support for use-inspired research and translation, the translation of research into innovations and products, the development of partnerships and collaborations that include traditional and nontraditional players, use-inspired and translational research infrastructure and capacity building, education and training of students, and identifying social, behavioral, and economic drivers and consequences of technological innovations that could enable advances in the challenges and key technology focus areas.

Sec. 10384. Requirements.
Requires the Foundation to ensure the programmatic work of the Foundation and the TIP directorate utilize the full potential of the U.S. workforce by avoiding undue geographic concentration of funding encourage broader participation by populations historically underrepresented in STEM, and incorporate a worker perspective.

Sec. 10385. Assistant Director.
Establishes an Assistant Director position to manage the directorate.

Sec. 10386. Advisory committee.
Establishes an advisory committee to assess the activities carried out by the directorate and propose new strategies for fulfilling the purpose of the directorate.

Sec. 10387. Challenges and focus areas.
Directs the Foundation, in consultation with the Assistant Director, the National Science Board, and an interagency committee, to identify and annually review and update, as appropriate, a list of societal, national, and geostrategic challenges and key technology focus areas to guide investments of the directorate.

Sec. 10388. Regional Innovation Engines.
Supports Regional Innovation Engines to advance multidisciplinary, collaborative, use-inspired and translation research and technology development in key technology focus areas, including through support for multi-user testbeds and instrumentation and graduate student traineeships.

Sec. 10389. Translation accelerator.
Supports Translation Accelerators to facilitate partnerships and advance research, development, and commercialization in key technology focus areas.

Sec. 10390. Test beds.
Supports the establishment and operation of test beds to advance development, operation, integration, deployment, and demonstration of innovative critical technologies.

Sec. 10391. Planning and capacity building awards.
Supports technology transfer capacity building for research institutions, including support for identifying academic research with potential for technology transfer and commercialization, ensuring availability of technology transfer expert staff, helping to offset cost of patenting and licensing, developing private sector partnerships, and supporting education and training of entrepreneurial students and faculty. Supports the establishment of Collaborate Innovation Resource Centers to promote regional technology transfer.

Sec. 10392. Entrepreneurial fellowships.
Establishes a fellowship program to provide scientists with entrepreneurial training.

Sec. 10393. Scholarships and fellowships.
Supports scholarships, fellowships, traineeships, and postdoctoral awards in key technology focus areas. Supports a scholarship to enable low-income individuals to pursue degrees in STEM fields.

Sec. 10394. Research and development awards.
Supports competitive research and technology development awards to accelerate technological advances and technology adoption in the key technology focus areas.

Sec. 10395. Scaling innovations in PreK-12 STEM education.
Supports multidisciplinary research and translation centers to scale effective STEM education innovations.

Sec. 10396. Authorities.
Provides flexible funding and hiring authorities. Authorizes appointment of and outlines responsibilities for program directors.

Sec. 10397. Coordination of activities.
Directs the Foundation to coordinate and avoid duplication with other Federal research agencies in carrying out activities of the directorate.

Sec. 10398. Ethical, legal, and societal considerations.
Directs the Foundation to take steps to ensure that ethical, legal, and societal considerations are integrated into the activities of the directorate.

Sec. 10399. Reports and roadmaps.
Directs the Foundation to provide an annual report describing the activities of the directorate, a roadmap describing the strategic vision that will guide future investment decisions, reports describing the activities of the directorate, and a report describing the use of alternative methods for award selection.

Sec. 10399A Evaluation.
Directs an evaluation of the success of the directorate in achieving its purpose, the impact of the directorate's activities on the Foundation's primary science mission, and coordination with other Federal agencies.

SUBTITLE H – ADMINISTRATIVE AMENDMENTS

Sec. 10399D. Supporting veterans in STEM careers.
Provides a technical fix.

Sec. 10399E. Sunshine Act compliance.
Adjusts the requirement for an annual review and report by the Office of the Inspector General of the National Science Board meetings to a risk-based approach for compliance reviews.

Sec. 10399F. Science and engineering indicators report submission.
Changes the deadline for a biennial report on science and engineering indicators from January 15 to March 15.

TITLE IV – BIOECONOMY RESEARCH AND DEVELOPMENT

Sec. 10401. Definitions.
Defines the terms “Initiative” and “Omics”.

Sec. 10402. 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, novels tools and technologies to accelerate research, testbeds for technology scale-up, 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 shall take into account the ethical, legal, environmental, safety, security, and other appropriate societal concerns.

Sec. 10403. 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.

Sec. 10404. Advisory committee on Engineering Biology Research and Development.
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 5 years.

Sec. 10405. External review of ethical, legal, environmental, safety, security, and societal issues.
Requires a National Academy of Sciences workshop to review the ethical, environmental, societal, and health concerns related to engineering biology research and development.

Sec. 10406. Agency activities.
Describes specific Initiative activities and responsibilities for the National Science Foundation, the National Institute of Standards and Technology, the National Oceanic and Atmospheric Administration, the Department of Energy, the Department of Defense, the National Aeronautics and Space Administration, the Department of Agriculture, the Environmental Protection Agency, and the Department of Health and Human Services.

Sec. 10407. Rule of construction.
States that nothing in the title will be construed to require public disclosure of information that is exempt from mandatory disclosure.

TITLE V – BROADENING PARTICIPATION IN SCIENCE

SUBTITLE A – STEM OPPORTUNITIES

Sec. 10501. Federal science agency policies for caregivers.
Requires OSTP to develop guidance to Federal research agencies regarding establishment of policies to provide no-cost extensions and flexibility in award start time to recipients of Federal grants with caregiving responsibilities.

Sec. 10502. Collection and reporting of data on Federal research awards.
Requires each Federal research agency to collect comprehensive demographic data on recipients of Federal awards and to report this data to NSF for summarization and publication. The NSF shall establish and update a policy to ensure standardization of the data collected.

Sec. 10503. Policies for review of Federal research awards.
Requires Federal research agencies to regularly assess and update policies and practices to remove or reduce cultural and institutional barriers limiting the recruitment and retention of historically underrepresented minorities, including in reviewing award applications, hiring policies, and workforce policies, and directs agencies to implement evidence-based practices to mitigate bias in the merit review process.

Sec. 10504. Collection of data on demographics of faculty.
Requires NSF to carry out a survey of STEM faculty demographics at institutions of higher education and to summarize and publish data collected under this section.

Sec. 10505. Cultural and institutional barriers to expanding the academic and Federal STEM workforce.
Requires OSTP to develop and disseminate guidance to universities and Federal laboratories on best practices to help identify any cultural or institutional barriers limiting the recruitment, retention, and advancement of women and underrepresented minorities in STEM research careers. Directs NSF and Federal research agencies with Federal laboratories to develop policies requiring institutions and laboratories to report on steps taken based on OSTP guidance.

Sec. 10506. Existing Activities.
Clarifies that Federal research agencies may satisfy requirements through existing activities and programs.

Sec. 10507. Report to Congress.
Requires OSTP to submit a report to Congress with a description and evaluation of the status and usage of policies, and progress on efforts to reduce barriers limiting the recruitment, retention and success of groups historically underrepresented in academic and government STEM research careers.

Sec. 10508. Merit review.
Clarifies that nothing in this Act shall be construed as altering any intellectual or broader impacts criteria at Federal research agencies for evaluating award applications.

Sec. 10509. Determination of budgetary effects.
PAYGO language.

Sec. 10510. Definitions.

SUBTITLE B – RURAL STEM EDUCATION RESEARCH

Sec. 10511. Definition.

Sec. 10512. National Science Foundation rural STEM activities.
Authorizes the National Science Foundation (NSF) to support research to advance innovative approaches in STEM teaching in rural schools and improve participation and advancement of rural students in STEM studies, including through a pilot program of regional rural cohorts that provide peer support, mentoring, and hands-on research experiences for rural STEM educators. Directs the NSF Committee on Equal Opportunities in Science and Engineering (CEOSE) to report to Congress an assessment of NSF activities that support participation of rural students in STEM studies.

Sec. 10513. Opportunities for online education.
Authorizes NSF to support research on online STEM education and mentoring in rural communities.

Sec. 10514. National Academies evaluation.
Directs NSF to enter into an agreement with the National Academies of Sciences, Engineering, and Medicine for an evaluation of Federal investments in rural STEM education, an assessment of research and data needs, and recommendations for improving STEM education in rural communities.

Sec. 10515. GAO review.
Directs GAO to study the engagement of rural populations in Federal STEM programs and submit report to Congress.

Sec. 10517. NIST engagement with rural communities.
Directs the Secretary of Commerce to establish a prize competition to stimulate innovation in technologies to deploy broadband connectivity to rural communities.

SUBTITLE C – MSI STEM ACHIEVEMENT

Sec. 10521. Government Accountability Office review.
Directs GAO to report to Congress an inventory of Federal research agency competitive funding programs targeted to MSIs. GAO is also directed to assess Federal research agency outreach to MSIs and make recommendations for steps agencies can take to increase the participation and competitiveness of MSIs in such programs.

Sec. 10522. Agency responsibilities.
Directs OSTP to issue uniform policy guidance for Federal research agencies to improve outreach to MSIs with the goal of increasing awareness among MSIs of funding opportunities and building MSI capacity to submit competitive proposals and successfully manage awards. OSTP is also directed to work with Federal research agencies to develop a strategic plan for how to modify existing or develop new award programs or processes to make Federal STEM education and research funding more accessible to MSIs.
Sec. 10523. Research at the National Science Foundation.
Supports NSF research on the challenges and successes MSIs have had in contributing to the STEM workforce. Supports research focused on building the research capacity of MSIs, encouraging mutually beneficial partnerships, providing students with research experiences, and scaling up successful model programs for use by other universities.

Sec. 10524. Capacity-Building Program for Developing Universities.
Supports administrative capacity building activities to increase the capacity of MSIs to compete for and manage Foundation research and development awards, including the establishment of MSI Centers of Innovation.

Sec. 10525. Tribal Colleges and Universities Program.
Requires NSF to award grants through the Tribal Colleges and Universities Program to increase participation in computer science and computational thinking education programs.

Sec. 10526. Definitions.
Defines terms used throughout the subtitle.

SUBTITLE D – COMBATING SEXUAL HARASSMENT IN SCIENCE

Sec. 10531. Findings.
Expresses findings from a National Academies report on sexual harassment in academia, and other sources.

Sec. 10532. Purpose.
Establishes the purpose of the division as increasing understanding of sex-based and sexual harassment, to advance evidence-based approaches to reducing their prevalence and impact.

Sec. 10533. Definition.
Defines terms used throughout the subtitle.

Sec. 10534. Research awards.
Supports research to advance the understanding of sexual harassment in the STEM workforce and develop effective interventions to reduce the incidence and negative consequences of such harassment.

Sec. 10535. Responsible conduct guide.
Requires NSF to enter into agreement with the National Academies to update the report *On Being a Scientist: A Guide to Responsible Conduct in Research* to include updated professional conduct standards, including promising practices for preventing and addressing the negative impact of sexual harassment and promising practices for mitigating research security risks.

Sec. 10536. Interagency working group.
Requires OSTP to establish or designate an interagency working group to coordinate Federal research agency efforts to reduce the prevalence of sexual harassment involving federally funded researchers and to develop and implement uniform policy guidelines for Federal research agencies.

Sec. 10537. National academies assessment.
Requires NSF to enter into agreement with the National Academies to undertake a follow-on study to examine the influence of sexual harassment in institutions of higher education on the career advancement of individuals in the STEM workforce and assess progress in implementing recommendations from the 2018 report.

Sec. 10538. GAO study.
Directs GAO to assess Federal research agency implementation of OSTP policy guidance related to preventing and mitigating sexual harassment in the academic STEM workforce.

Sec. 10539. Authorization of appropriations.

TITLE VI – MISCELLANEOUS SCIENCE AND TECHNOLOGY PROVISIONS

SUBTITLE A – SUPPORTING EARLY-CAREER RESEARCHERS

Sec. 10601. Early-career research fellowship program.
Authorizes the National Science Foundation to establish a 2-year pilot program to support highly-qualified early-career scientists to conduct research for up to 2 years at the institution of their choice.

Sec. 10602. Authorization of appropriations.
Authorizes $250 million for each of fiscal years 2023 and 2024 for this program.

SUBTITLE B – NATIONAL SCIENCE AND TECHNOLOGY STRATEGY

Sec. 10611. National science and technology strategy.
Requires the Director of the Office of Science and Technology Policy to develop and submit to Congress a 4-year comprehensive national science and technology ("S&T") strategy, primarily focused on economic security. Requires that the S&T strategy be consistent with other relevant Federal strategies, such as the national defense strategy, and describes the required elements of the report. The reporting requirement under this provision will terminate ten years after enactment of this Act.

Sec. 10612. Strategy and Report on the Nation's Economic Security, Science, Research, and Innovation to Support the National Security Strategy.
Requires the Director of the Office of Science and Technology Policy to periodically develop or revise a national security-focused science and technology strategy in support of the existing National Security Strategy required by the National Security Act of 1947. The reporting requirement under this provision will terminate five years after enactment of this Act.

Sec. 10613. Quadrennial Science and Technology Review.
Requires the Director of the Office of Science and Technology Policy to conduct a quadrennial review of the science and technology enterprise and describes specific requirements for the scope and contents of each quadrennial review. The reporting requirement under this provision will terminate ten years after enactment of this Act.

SUBTITLE C – REGIONAL INNOVATION

Sec. 10621. Regional Innovation Capacity.
Directs the Department of Commerce to create 20 geographically distributed "regional technology and innovation hubs" in areas that are not leading technology centers. These hubs will focus on technology development, job creation, and expanding U.S. innovation capacity. The provision authorizes $10 billion for the program from Fiscal Year 2023 through Fiscal Year 2027 and directs the Secretary to designate at least three new "hubs" in each of the Economic Development Administration's six regions.
Authorizes $1 billion as part of establishing the "Recompete Pilot Program" to support persistently distressed communities.

Sec. 10622. Regional Clean Energy Innovation Program.
Amends the Energy Independence and Security Act of 2007 to authorize a Regional Clean Energy Innovation Program at the Department of Energy to establish regional partnerships that promote the economic development of diverse geographic areas of the United States by supporting clean energy innovation. Awards are capped at $10 million over five years and require a cost-share of 50% in years 3, 4, and 5, of the grant, with an optional renewal for an additional five years. Authorizes grants in the amount of $2 million for government entities, in partnership with other entities, to conduct planning activities to set up a regional clean energy innovation partnership.

SUBTITLE D – RESEARCH SECURITY

Sec. 10631. Requirements for foreign talent recruitment programs.
Directs the Office of Science and Technology Policy ("OSTP") to issue guidance to Federal research agencies to prohibit participation in "foreign talent recruitment programs" by agency personnel and provide additional clarification to the research community regarding which activities are considered "foreign talent recruitment programs." OSTP is also directed to issue guidance clarifying that researchers working on Federally supported research projects must disclose participation in foreign talent recruitment programs in Federal research award proposals.

OSTP is further directed to issue guidance for Federal research agencies to prohibit researchers working on agency-funded projects from participating in "malign foreign talent recruitment programs."

Federal research agencies are directed to implement OSTP guidance and OSTP is tasked with ensuring that the subsequent agency policies are consistent to the greatest extent practicable.

Sec. 10632. Malign foreign talent recruitment program prohibition.
Requires Federal research agencies to establish policies to prohibit awards to individuals party to a "malign foreign talent recruitment program," subject to certain existing laws. Also clarifies that beneficial international collaboration activities are not prohibited.

Sec. 10633. Review of contracts and agreements.
Authorizes Federal research agencies to require submission of contracts, agreements, and other supporting documentation upon request. Also authorizes Federal research agencies to reduce or suspend funding, or terminate the award if the agency determines such agreements interfere with or duplicate the award activities.

Sec. 10634. Research security training requirement for Federal research award personnel.
Directs Federal research agencies to establish requirements for researchers working on agency awards to complete research security training. Directs the Office of Science and Technology Policy ("OSTP") to issue guidelines for universities to develop research security training programs. OSTP is also directed to support the development of online research training modules for universities to use or adapt to their needs.

Sec. 10635. Research funds accounting.
Directs the Government Accountability Office to conduct a study on Federal research funding made available to foreign entities of concern.

Sec. 10636. Person or entity of concern prohibition.
Establishes a prohibition on participation in certain programs and activities by foreign entities or persons of concern.

Sec. 10637. Nondiscrimination.
Directs Federal research agencies to ensure that research security policies and processes do not lead to the discrimination, targeting, or stigmatization of researchers based on their race, ethnicity, or national origin, consistent with the Civil Rights Act of 1964.

Sec. 10638. Definitions.
Provides various definitions used in the division, including "Malign Foreign Talent Recruitment Program."

SUBTITLE E—COASTAL AND OCEAN ACIDIFICATION RESEARCH AND INNOVATION

Sec. 10641. Short title.

Sec. 10642. Purposes.
Integrates the importance of research, monitoring, and adaptation strategies for both ocean and coastal acidification, taking into account other environmental and anthropogenic stressors.

Sec. 10643. Definitions.
Provides definitions for the terms "coastal acidification," "State," and "Tribal government," and updates existing definitions.

Sec. 10644. Interagency working group.
Expands the interagency working group on ocean acidification to include current participating agencies and specifically adds coastal acidification to subject matter covered by interagency working group. Establishes an Advisory Board to provide recommendations to the interagency working group that is comprised of representatives from industries impacted by ocean and coastal acidification, academia, non-governmental organizations, State and local governments, regional ocean acidification networks, and

others, and includes Tribal government engagement and coordination. This section also allows interagency working group agencies to carry out prize competitions that support innovation to advance research on, and response to, ocean and coastal acidification.

Sec. 10645. Strategic research plan.
Includes technical changes to the strategic research plan issued by Interagency Working Group.

Sec. 10646. NOAA ocean acidification activities.
Includes technical changes to NOAA ocean acidification activities and designates NOAA as the lead federal agency responsible for coordinating the federal response to ocean and coastal acidification. Also requires NOAA to support long-term data stewardship and access to ocean and coastal acidification data.

Sec. 10647. NSF ocean acidification activities.
Includes technical changes to NSF ocean acidification activities.

Sec. 10648. NASA ocean acidification activities.
Includes technical changes to NASA ocean acidification activities.
Sec. 10649. Authorization of appropriations
Authorizes $20.5 million for fiscal year 2023, $22 million for fiscal year 2024, $24 million for fiscal year 2025, $26 million for fiscal year 2026, and $28 million for fiscal year 2027 for the NOAA ocean acidification activities. Also authorizes $20 billion for the NSF ocean acidification activities from fiscal years 2023 through 2027.

SUBTITLE F—INTERAGENCY WORKING GROUP

Sec. 10651. Interagency Working Group.
Requires an interagency working group, led by the Director of the Office of Science and Technology Policy under the National Science and Technology Council, to coordinate, across the Federal government, several activities authorized under this Act at the Department of Commerce, the Department of Energy, and the National Science Foundation.

SUBTITLE G—QUANTUM NETWORKING AND COMMUNICATIONS

Sec. 10661. Quantum Networking and Communications.
Requires the Subcommittee on Quantum Information Science of the National Science and Technology Council to create a report and Federal strategy for quantum networking and communications research. The provision also directs the National Institute of Standards and Technology to conduct research and standardization activities to support quantum networking and communications technologies. It directs the National Science Foundation ("NSF") to conduct quantum information science education and workforce development activities, including establishment of a quantum education pilot program to promote quantum information science workforce development across the nation. The Director of the NSF also must engage the National Academies for a study on the educational challenges associated with creating a diverse, flexible, and sustainable quantum workforce.

SUBTITLE H—BLOCKCHAIN SPECIALIST

Sec. 10671. Establishment of blockchain and cryptocurrency specialist position within OSTP.
Requires the Director of the Office of Science and Technology Policy to establish a blockchain and cryptocurrencies advisory specialist position within the Office to advise the President on matters relating to blockchain and cryptocurrencies.

SUBTITLE I—PARTNERSHIPS FOR ENERGY SECURITY AND INNOVATION

Sec. 10691. Foundation for Energy Security and Innovation.
Establishes a Foundation for Energy Security and Innovation (FESI) affiliated with the Department of Energy to engage with the private sector to raise funds that support the creation, development, and commercialization of innovative technologies that address tomorrow's energy challenges. Authorizes FESI to support workforce development initiatives associated with energy technology development. It includes an authorization of $40.5 million over fiscal year 2023 and 2027.

SUBTITLE J – ENERGIZING TECHNOLOGY TRANSFER

Sec. 10701. Definitions.

Part 1 – National Clean Energy Technology Transfer Programs

Sec. 10713. National clean energy incubator program.
Authorizes a program to support incubators that accelerate the commercial application of clean energy technologies by providing a physical workspace or support, such as business education and mentorship to clean energy technology startups or companies. Awards authorized are limited to $4 million per state for one or more incubators, for a period of no longer than 5 years, with the option for a renewal of not more than 3 years. It authorizes $15,000,000 for each of fiscal years 2023 through 2027.

Sec. 10714. Clean energy technology university prize competition.
Authorizes a prize competition for university students to develop a business model for furthering the commercial application of an innovative clean energy technology to encourage student interest in clean energy technology development in diverse regions of the U.S. This prioritizes funding entities that work with students at minority-serving institutions. It authorizes $1,000,000 for each of fiscal years 2023 through 2027.

Sec. 10715. Clean energy technology transfer coordination.
Authorizes the Secretary of Energy to support the coordination of relevant technology transfer programs within the Department of Energy. Coordination activities include information sharing, connecting entrepreneurs and startup companies to the variety of programs related to clean energy technology transfer under the Department of Energy, and the development of metrics to measure the impact of clean energy technology transfer programs. It authorizes $3,000,000 for each of fiscal years 2023 through 2027.

Part 2 – Supporting Technology Development at the National Laboratories

Sec. 10716. Lab partnering service pilot program.
Authorizes funds for the Lab Partnering Service Pilot Program as authorized in Section 9002 of division Z of the Consolidated Appropriations Act, 2021 (Public Law 116-260). It authorizes $3,700,000 for each of fiscal years 2023-2025.

Sec. 10717. Lab-embedded entrepreneurship program.
Authorizes a program to provide entrepreneurial fellows with access to national laboratory research facilities, expertise, and mentorship to assist with the commercial application of research ideas. It authorizes $25,000,000 for each of fiscal years 2023 through 2027.

Sec. 10718. Small business voucher program.
Revises section 1003 of the Energy Policy Act of 2005 (42 U.S.C. 16393), which authorizes a program for the Secretary of Energy, in consultation with the Directors of the National Laboratories, to provide small businesses with vouchers to perform research, development, demonstration, technology transfer, skills training and workforce development, or commercial application activities at the national laboratories. It authorizes $25,000,000 for each of fiscal years 2023 through 2027.

Sec. 10719. Entrepreneurial leave program.
Authorizes the Secretary of Energy to delegate to the Directors of the National Laboratories the authority to carry out an entrepreneurial leave program, allowing national laboratory employees to take a leave of absence from their employment for up to 3 years to advance the commercial application of energy and related technologies relevant to the mission of the Department of Energy. Requires the establishment of streamlined mechanisms for facilitating the licensing of technology that is the focus of an employee who participates in this program.

Sec. 10720. National laboratory non-Federal employee outside employment authority.
Authorizes the Secretary of Energy to delegate to the Directors of the National Laboratories the authority to allow their non-Federal employees to engage in outside employment and consulting activities.

Part 3 – Department of Energy Modernization

Sec. 10722. Office of technology transitions.
Amends Section 1001(a) of the Energy Policy Act of 2005 (42 U.S.C. 16391) to give the Under Secretary for Science the authority to appoint personnel using the authorities in section 305 of the Energizing Technology Transfer Act and authorizes funds for this section and the Office of Technology Transitions as authorized in Section 9001 of division Z of the Consolidated Appropriations Act, 2021 (Public Law 116-260). It authorizes $20,000,000 for each of fiscal years 2023 through 2027.

Sec. 10723. Management of demonstration projects.
Amends section 41201 of the Infrastructure Investment and Jobs Act (42 U.S.C. 18861) to ensure the Office of Clean Energy Demonstration (OCED) coordinates with the Office of Technology Transitions, the Loan Program Office, and all applied program offices within the Department of Energy. Provides additional direction for hiring for the OCED, additional authority to allow the OCED to solicit, select, and manage covered projects directly through the program, and direction for project termination.

Sec. 10724. Streamlining prize competitions.
Amends Section 1008 of the Energy Policy Act of 2005 (42 U.S.C. 16396) to add reporting requirements for prize competitions.

Sec. 10725. Cost-share waiver extension.
Extends the cost-share waiver pilot program for non-profit institutions and institutions of higher education granted in Section 108 of the Department of Energy Research and Innovation Act by 2 years.

Sec. 10726. Special hiring authority for scientific, engineering, and project management personnel.
Authorizes the Under Secretary for Science to make appointments for scientific, engineering, and professional personnel for a term of not more than 3 years.

Sec. 10727. Technology transfer reports and evaluation.
Updates reporting requirements as authorized in Section 9007 of division Z of the Consolidated Appropriations Act, 2021 (Public Law 116-260).

SUBTITLE K—Micro Act

Section 10731. Microelectronics research for energy innovation.
Requires the Department of Energy to establish a program on the research, development, demonstration, and commercial application of microelectronics to meet the mission needs of the Department and to drive the nation's global competitiveness in the field of microelectronics. It includes authorizations of $75,000,000 for fiscal year 2023 and $100,000,000 for each of fiscal years 2024 through 2027. This provision also establishes up to four Microelectronics Science Research Centers to conduct mission driven research to address foundational challenges in the design, development, and fabrication of microelectronics and to facilitate the translation of research results to industry, including authorizations of $25,000,000 per year for each of fiscal years 2023 through 2027. Authorizes workforce development and educational outreach efforts to accompany research activities.

SUBTITLE L—NATIONAL NUCLEAR UNIVERSITY RESEARCH INFRASTRUCTURE REINVESTMENT

Sec. 10741. Short title.

Sec. 10742. Purposes.
Upgrades nuclear research capabilities of U.S. universities; ensures the continued operation of university research reactors; coordinates available resources to enable the establishment of new nuclear science and engineering facilities; and supports nuclear energy workforce development and the establishment or enhancement of nuclear science and engineering capabilities at historically Black colleges and universities, Tribal colleges or universities, minority-serving institutions, Established Program to Stimulate Competitive Research universities, and junior or community colleges.

Sec. 10743. University infrastructure collaboration.
Amends the Energy Policy Act of 2005 to improve collaboration between relevant nuclear energy university stakeholders and to maintain and upgrade existing university research reactor infrastructure. Authorizes $55 million for each of fiscal years 2023 through 2027 for these activities.

Sec. 10744. Advanced nuclear research infrastructure enhancement subprogram.
Amends the Energy Policy Act of 2005 to establish a new university infrastructure subprogram that will further the development of advanced nuclear technologies including by establishing not more than four new research reactors and new nuclear science and engineering facilities. Authorizes a total of $390M over fiscal years 2023 through 2027 for these activities.

Sec. 10745. Science education and human resources scholarships, fellowships, and research and development projects.
Adds nontechnical nuclear research to the scope for the University Nuclear Leadership Program; increases authorization of appropriations for this program by $15M for fiscal years 2023 through 2025.

SUBTITLE M—STEEL UPGRADING PARTNERSHIPS AND EMISSIONS REDUCTION

Sec. 10751. Low-emissions steel manufacturing research program.
Authorizes a Department of Energy research, development, demonstration, and commercial application program of advanced tools, technologies, and methods for low-emissions steel manufacturing, focusing on several key technology areas, including heat generation, carbon capture, smart manufacturing, resource efficiency, alternative materials, and high-performance computing. It also directs the Secretary to support an initiative for the demonstration of low-emissions steel manufacturing in collaboration with industry partners, institutions of higher education, and the National Laboratories, and to consider leveraging the resources of the Manufacturing USA Institutes.

SUBTITLE N - APPLIED LABORATORIES INFRASTRUCTURE RESTORATION AND MODERNIZATION

Sec. 10761. Applied laboratories infrastructure restoration and modernization.
Authorizes $800 million in total funding for deferred maintenance, critical infrastructure needs, and modernization activities across National Laboratories for each of fiscal years 2023 through 2027, including National Renewable Energy Laboratory, National Energy Technology Laboratory, Idaho National Laboratory, Savannah River National Laboratory, Sandia National Laboratories, Los Alamos National Laboratory, Lawrence Livermore National Laboratory.

SUBTITLE O - DEPARTMENT OF ENERGY RESEARCH, DEVELOPMENT, AND DEMONSTRATION ACTIVITIES

Sec. 10771. Department of Energy research, development, and demonstration activities.
Authorizes $11.2 billion for research, development, and demonstration aligned with the 10 technology areas in the applied energy offices. Authorizes appropriations for building technologies, sustainable transportation, advanced manufacturing, industrial emissions reduction technology, advanced materials, and renewable power research, development, and demonstration within the Office of Energy Efficiency and Renewable Energy. It also authorizes appropriations for grid modernization research, development and demonstration within the Office of Electricity. Authorizes appropriations for advanced materials research, development, and demonstration within the Office of Nuclear Energy. It also authorizes appropriations for artificial intelligence and information technologies within the Office of Environmental Management. Authorizes appropriations for clean industrial technologies, alternative fuels, and carbon removal research, development, and demonstration within the Office of Fossil Energy and Carbon Management. It also authorizes appropriations for the Advanced Research Projects Agency—Energy.

SUBTITLE P - FISSION FOR THE FUTURE

Sec. 10781. Advanced Nuclear Technologies Federal Research, Development, and Demonstration Program.
Directs the Secretary to establish a program to provide Federal financial assistance to eligible entities to support the research, development, and demonstration of advanced nuclear reactors. In carrying out this program, the Secretary shall prioritize projects that would be located in communities that have retired or retiring fossil fuel electric generation facilities, as well as projects that would support nonelectric applications, such as heating, hydrogen production, or industrial processes. The provision authorizes $800,000,000 to be appropriated to the Secretary to carry out the program for the fiscal years 2023-2027.

TITLE VII—NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT

Sec. 10801. Short title.
States that the title may be cited as the "National Aeronautics and Space Administration Authorization Act of 2022.''

Sec. 10802. Definitions.
Defines the terms "Administration," "Administrator", "Appropriate Committees of Congress", "Cislunar Space", "Deep Space", "Development Cost", "Government Astronaut", "ISS", "Low-Enriched Uranium", "NASA", "Orion", "OSTP", "Space flight participant", "Space launch system", and "Unmanned aircraft; unmanned aircraft system."

Subtitle A—Exploration

Sec. 10811. Moon to Mars.
Provides the sense of Congress on advances in space technology and space exploration capabilities, the Artemis missions, and the implementation of Artemis missions. It would also direct the Administrator, within 120 days of enactment, to establish a Moon to Mars Office within the Exploration Systems Mission Directorate and a Moon to Mars Program, including the Artemis Missions to the Moon, to achieve the goal of human exploration of Mars, and to include a set of Program elements.
Further directs the Administrator to appoint a Director of the Program to lead the Moon to Mars Office and specifies responsibilities for the Director, including establishment of a program-wide systems engineering and integration function. It would also direct the Administrator to submit a study, 180 days after enactment, on progress toward the Program, the Office, and the efforts therein.

Sec. 10812. Space Launch System configurations.
Requires NASA to develop the Exploration Upper Stage (EUS) of the Space Launch System (SLS) rocket in time for the Artemis IV lunar mission. This section would also direct NASA to develop necessary ground infrastructure, including a second mobile launch platform, to support the EUS-enabled SLS, and set a goal of two SLS flights per year, as practicable.

Sec. 10813. Rocket engine test infrastructure.
Requires NASA to continue working to maintain and modernize rocket propulsion test infrastructure, to the extent practicable, with priority given to projects that can be used by multiple users and propulsion systems. It would also require a study on the use of a working capital fund to promote increased use of NASA rocket propulsion test infrastructure.

Sec. 10814. Pearl River maintenance.
Requires NASA to coordinate with the Army Corps of Engineers to ensure the continued navigability of the Pearl River and Little Lake channels sufficient to support NASA barge operations surrounding Stennis Space Center and the Michoud Assembly Facility.

Sec. 10815. Extension and modification relating to International Space Station.
Amends U.S. Code to extend International Space Station (ISS) operations through 2030 and to continue reports to Congress on the technical feasibility of such an extension. Currently the station is

Congressionally-authorized through at least 2024. China currently remains the only other nation with a human-tended space station.

Sec. 10816. Priorities for International Space Station.
Directs the Administrator to assess International Space Station research activities and ensure that the Administration's allocation of International Space Station crew time and resources is used to prioritize efforts to reduce human health and performance risks on long-duration spaceflights; reduce risks for exploration technologies; and advance basic and applied space life and physical science research. This section would require reporting to the appropriate committees of Congress, including on the assessment and on steps taken to achieve the required prioritization.

Sec. 10817. Technical amendments relating to Artemis missions.
Replaces references in U.S. Code to reflect current NASA nomenclature.

Subtitle B—Science

Sec. 10821. Science priorities.
Puts forth a sense of Congress that a balanced portfolio of science activities serves as a catalyst for innovation, that the Research and Analysis programs funded by the Science Mission Directorate are critically important. It would also require that NASA pursue specific funding goals for Research and Analysis in the Science Mission Directorate.

Sec. 10822. Search for life.
Puts forth a sense of Congress that a National Academies report on the search for life in the universe outlines key research questions. It would require NASA to continue its multidisciplinary science and technology development program to search for life beyond Earth in support of the scientific priorities outlined by the National Academies and previously-directed Congressional direction, and require NASA to fund activities under this program, which may include merit-reviewed, competitively awarded research on technosignatures.

Sec. 10823. Next generation of astrophysics Great Observatories.
Puts forth a sense of Congress that NASA's Great Observatories have enabled major scientific advances, that the most recent astronomy and astrophysics decadal survey recommended studying the universe through a range of observation types, that the United States and NASA are uniquely poised to lead the world in the implementation of the next generation of Great observatories, and that the Administrator should pursue an ambitious astrophysics program that meets the scientific vision of the astronomical community and implement lessons learned from previous astrophysics missions to avoid major cost growth in flagship-class missions.

Also directs the Administrator to continue the Nancy Grace Roman Space Telescope in the configuration established through critical design review and following the requirements under section 30104 of title 51 on cost and schedule and direct the Administrator to provide quarterly reports to the appropriate committees of Congress on the telescope's progress.

Sec. 10824. Earth science missions and programs.
Puts forth a sense of Congress that NASA's Earth science programs provide valuable data for various natural resource and environmental concerns, and that robust and balanced Earth science research

significantly contributes to supporting economic growth and the health and safety of the citizens of the world. It would further direct NASA to implement recommendations and guidance, to the maximum extent practicable, from the decadal survey, pursue an Earth System Observatory to conduct observations in high-priority areas as designed by the decadal, conduct a survey of the use of NASA Earth observation data, and maintain a climate architecture plan.

Sec. 10825. Planetary Defense Coordination Office.
Puts forth a sense of Congress that near-Earth objects are a threat to the United States and that Congress requires NASA to implement a Near-Earth Object survey to detect, track, catalogue, and characterize near-Earth objects, and that NASA should develop and launch a space-based infrared telescope to detect potentially hazardous near-Earth objects.

Further requires NASA to maintain a Planetary Defense Coordination Office to plan, develop, and implement the program to survey threats posed by near-Earth objects, issue warnings, and coordinate potential government response to threats. It would also require an annual report to Congress on the progress of the survey and the telescope, until completion, and it would require NASA to continue development of a Near-Earth Object Surveyor mission.

Subtitle C—Aeronautics

Sec. 10831. Experimental aircraft projects.
Puts forth a sense of Congress that developing high-risk aerospace technologies is a fundamental role of NASA, that large-scale flight tests are necessary, and that funding to support large-scale flight tests should be ensured over a sustained period of time. It would put forth a policy of the United States to maintain world leadership in aeronautics and maintain the steady progression and expansion of flight research and capabilities as a fundamental objective of the aeronautics research of NASA.
Also requires NASA to carry out experimental aircraft demonstrations, including a subsonic demonstrator to demonstrate the performance and feasibility of advanced, ultra-efficient and low emissions designs, a low-boom supersonic flight demonstrator, and a flight research demonstrator, and require NASA to expand collaboration with industry and academia on experimental aircraft. In addition, it would authorize NASA to establish an advanced materials and manufacturing technology program, which includes composite materials, to address U.S. competitiveness in aerospace.

Sec. 10832. Unmanned aircraft systems.
Requires NASA to continue to conduct research and testing to support the safe integration of unmanned aircraft systems ("UAS") into the national airspace system ("NAS"), and advise NASA that it is the sense of Congress that it should partner with industry and the Federal Aviation Administration ("FAA") to advance these technologies.

Sec. 10833. Cleaner, quieter airplanes
Requires NASA to establish a research and development initiative on reducing greenhouse gas and noise emissions from aircraft, with additional requirements on test flights, technology focus areas, and partnerships with industry and academia. It would also require an annual report on progress of the initiative.

Subtitle D—Space Technology

Sec. 10841. Space nuclear capabilities.
Requires NASA to continue the development of nuclear propulsion technology, including related research and development, testing, and demonstration, to enable its use for human and robotic missions to Mars in the 2030s and submit a plan to Congress that details how NASA will achieve an in-space test of such a system. This section would also require NASA to maintain a program for nuclear surface power and direct NASA to assess nuclear propulsion test facility needs and submit a report to Congress.

Sec. 10842. Prioritization of low-enriched uranium technology.
Requires NASA to prioritize the use of low-enriched, including high-assay low-enriched uranium for space nuclear power and propulsion research and development. The section would also require a report to Congress on measures taken pursuant to the prioritization requirement, and it would further require that the administrator collaborate with other Federal agencies on nuclear power and propulsion activities for space applications.

Subtitle E—STEM Engagement

Sec. 10851. Office of STEM Engagement.
Authorizes NASA's Office of STEM Engagement and require that it continue to coordinate NASA STEM educational activities, including the Established Program to Stimulate Competitive Research (EPSCoR), the Minority University Research and Education Project (MUREP), and the National Space Grant College and Fellowship Program.

Subsection F—Miscellaneous

Sec. 10861. Program, workforce, and industrial base reviews.
Directs NASA to conduct and submit a study to Congress on the workforce and industrial base for civil space, including supply chains, critical skills, infrastructure, and modeling and test capabilities. It further directs the development of an Administration policy and procedure for assessing, not less frequently than every 5 years, the strategic capabilities of the Administration, and the Administrator to arrange for, via the National Academies, a comprehensive review of the NASA workforce, skills-base, and modeling and test facilities. The section would also establish a Program Analysis and Evaluation Office at NASA, which must be independent of any program.

Sec. 10862. Modification of lease of non-excess property.
Amends Title 51 to extend NASA's enhanced use leasing (EUL) authority for 10 years, through 2032, and require NASA to include quantifiable data, including on cost savings and benefits, resulting from use of EUL authority in its annual report.

DIVISION C—SUPPLEMENTAL APPROPRIATIONS TO ADDRESS THREATS TO THE SUPREME COURT OF THE UNITED STATES