COMMITTEE ON
SCIENCE, SPACE AND TECHNOLOGY
CHAIRMAN FRANK LUCAS

FULL COMMITTEE

HEARING CHARTER

"Examining NIST's Priorities for 2025 and Beyond"

Wednesday, May 22, 2024
10:00 a.m.
2318 Rayburn House Office Building

Purpose
The purpose of the hearing is to review the National Institute of Standards and Technology's (NIST) priorities, including expanding manufacturing programs; strengthening supply chains and addressing critical workforce gaps; expanding cutting-edge research; and addressing maintenance and facilities backlogs. In addition, please be prepared to update the Committee on the progress of the CHIPS for America Program and the Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence. This hearing will also serve as an opportunity to discuss the Administration's NIST FY25 budget request.

Witnesses
- **The Honorable Dr. Laurie Locascio,** Under Secretary of Commerce for Standards and Technology and Director, National Institute of Standards and Technology, United States Department of Commerce

Overarching Questions
- What new initiatives and terminations are proposed in the FY25 budget request for NIST?
- Being known as "industry's lab," how is NIST responding to and meeting the ever-changing needs of industry as new opportunities arise and technology evolves?
- What progress has the Department of Commerce and NIST made in making both the incentive and R&D awards authorized in the CHIPS for America Program? And how are the guardrails for the incentive program being enforced?
- What is the state of facilities on NIST campuses and what is the impact on NIST's ability to carry out its mission?
- What role does NIST play in working with U.S. industry to build safe and trustworthy artificial intelligence systems?
- How does the President's budget request support U.S. leadership in Quantum Information Sciences?

Background
The National Institute of Standards and Technology (NIST) is a non-regulatory agency within the Department of Commerce. Originally founded in 1901 as the National Bureau of Standards, NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life. By working closely alongside industry, NIST has become recognized as a provider of high-quality information utilized by the private sector.

NIST operates two main research laboratories in Gaithersburg, Maryland and Boulder, Colorado, as well as radio stations in Hawaii and Colorado. NIST also maintains partnerships with the Hollings Marine Labs in Charleston, South Carolina, the JILA joint institute operated with the University of Colorado, and the Institute for Bioscience and Biotechnology Research (IBBR) and the Joint Quantum Institute, both operated in conjunction with the University of Maryland.

As of 2022, NIST employs about 3,400 scientists, engineers, technicians, support, and administrative personnel.[1] In addition, NIST annually hosts about 3,800 associates and facility users from academia, industry, and other government agencies.[2] NIST also partners with 1,450 manufacturing experts and staff at about 430 Manufacturing Extension Partnership (MEP) service locations around the country.[3]

NIST Budget Summary
The FY25 budget request for NIST is $1.498 billion, an increase of $38.5 million, or 2.6 percent from the FY24 enacted level.[4] The budget for NIST is divided into three main accounts: Scientific and Technical Research and Services (STRS), Industrial Technology Services (ITS), and Construction of Research Facilities (CRF).

[1] U.S. Gov't Accountability Off., GAO-23-105521, Improved Workforce Planning Needed to Address Recruitment and Retention Challenges (2023).
[2] Ibid
[3] Nat'l Inst. Standards & Tech., Partnerships, https://www.nist.gov/mep/about-nist-mep/partnerships (last visited Apr. 3, 2024).
[4] U.S. Dep't of Com., NIST-NTIS-FY2025-Congressional-Budget-Submission.pdf (Mar. 2024).

National Institute for Standards and Technology (NIST) Spending
(dollars in millions)

Account	FY23 Enacted	FY24 CR	FY25 President's Request	Change from FY24	% Change from FY24
STRS (Labs)	$953.0	$1,080.0	$975.0	($105.0)	-9.7%
Congressional External Projects	0	$222.8	0	(222.8)	-100%
Industrial Technology Service	$212.0	$212.0	$212.0	0	0%
Hollings MEP	$175.0	$175.0	$175.0	0	0%
Manufacturing USA (NNMI)	$37.0	$37.0	$37.0	0	0%
Construction of Research Facilities	$462.3	$168.0	$311.5	143.5	85.4%
Congressional External Projects	$332.3	$80.2	0	($80.2)	-100%
Overall	**$1,627.3***	**$1,460.0**	**$1,498.5**	**$38.5**	**2.6%**

**Excludes one-time supplemental funds. The FY23 Disaster Relief Supplemental provided an additional $40 M for STRS, $13M for MEP, and $14M for Manufacturing USA. The CHIPS & Science Act provided $50 Billion over 5 years, including $39 B in semiconductor incentives, to the Department of Commerce for the CHIPS for America program, which NIST is operating and overseeing.*

Scientific and Technical Research Services (STRS)
The FY25 NIST budget request for Scientific and Technical Research and Services (STRS), which supports the operations of six laboratories, is $975 million, a decrease of $105 million or 9.7 percent from the FY24 level.[5] It should be noted that of the nearly $1 billion NIST received for STRS in FY24, $222.8 million was for Congressionally-directed projects and provided $857.2 million for STRS activities. The NIST Laboratory Programs address increasingly complex measurement challenges, ranging from the very small (quantum devices for sensing and advanced computing) to the very large (vehicles and buildings), and from physical to virtual infrastructure (cybersecurity and the internet of things).

The FY25 budget proposal requests $65.6 million for the six user facilities it operates under STRS

- **Material Measurement Laboratory (MML):** The MML serves as the national reference laboratory for measurements in the chemical, biological, and material sciences.[5] The MML provides measurement services, tools, and best-practice guides used by a broad set of industries including but not limited to: healthcare (biomarkers), renewable energy

[5] Nat'l Inst. Standards & Tech., Material Measurement Laboratory, https://www.nist.gov/mml

(measuring the quality of fuels), and forensic science (biometric identification techniques).

- **Physical Measurement Laboratory (PML):** PML is a world leader in measurement science, developing tools and techniques to meet the demands of American industry and science, providing calibrations, and disseminating standards and best practices.[6] To maintain state-of- the-art capabilities in realizing, disseminating, and measuring these quantities, PML invests in fundamental scientific research to push boundaries and prepare for next-generation measurement needs. This measurement expertise also helps America address key technical challenges in manufacturing, energy, advanced microelectronics, healthcare, climate, and quantum science.
- **Engineering Laboratory (EL):** The EL conducts research on engineering and manufacturing processes, systems, and equipment; engineering of sustainable and energy-efficient buildings; and engineering of disaster-resilient buildings, communities, and infrastructure**.**[7] EL's studies of major disasters help guide research and develop recommendations for design and construction practices to reduce hazards.
- **Information Technology Laboratory (ITL):** The ITL develops and disseminates standards, measurements, and testing for interoperability, security, usability, and reliability of information systems, including cyber security standards and guidelines for federal agencies and U.S. industry.[8] As a world-class measurement and testing laboratory spanning diverse areas of computer science, mathematics, statistics, and systems engineering, ITL supports areas of national importance, including cybersecurity and privacy, artificial intelligence, the internet of things, reliable computing, and future computing technologies and applications.
- **Communication Technology Laboratory (CTL):** The Communications Technology Laboratory promotes the development and deployment of advanced communications technologies through the dissemination of high-quality measurements, data, and research supporting U.S. innovation, industrial competitiveness, and public safety[9]. CTL work establishes the metrological foundations for higher speeds, better connections, and more ubiquitous access amid rising wireless demand. CTL focuses on establishing vital technological foundations for the ongoing wireless revolution across public safety communications, next-generation communications for 5G and beyond, and testing for wireless innovations.
- **Center for Neutron Research (NCNR):** The NCNR provides a national user facility, utilized by universities, government, and industry, to study neutron-based measurement capabilities.[10] This level of measurement capabilities is unavailable anywhere else in the country, allowing researchers to answer questions in nanoscience and technology with a broad range of applications. On February 3, 2021, NIST shut down the NCNR after a single fuel element overheated and was damaged due to not being securely latched into place.[11] In March 2022, the Nuclear Regulatory Commission (NRC) issued a Special

[6] Nat'l Inst. Standards & Tech., Physical Measurement Laboratory, https://www.nist.gov/pml
[7] Nat'l Inst. Standards & Tech., Engineering Laboratory, https://www.nist.gov/el
[8] Nat'l Inst. Standards & Tech., Information Technology Laboratory, https://www.nist.gov/itl
[9] Ibid
[10] Nat'l Inst. Standards & Tech., NIST Center for Neutron Research, https://www.nist.gov/ncnr
[11] Nat'l Inst. Standards & Tech., Update on the Status of the NIST Center for Neutron Research (NCNR) (Feb. 2021), https://www.nist.gov/news-events/news/2021/02/update-status-nist-center-neutron-research-ncnr.

Inspection Report on the NCNR and later granted NIST authorization to restart the NCNR in March 2023.[12][13]

STRS Budget Priorities

As new technologies develop and evolve, NIST's measurement research and services remain critical to national defense, homeland security, trade, and innovation. Within the request levels, the budget includes funding for new efforts, including:

- **Artificial Intelligence (+$47.7M):** NIST is developing measurements and data that address the performance and reliability of AI systems to accelerate their widespread adoption and enable the nation to realize the potential economic, societal, and innovation benefits that AI systems offer to consumers. NIST has also provided the AI community with a framework for managing risks and maximizing benefits from AI systems: the AI Risk Management Framework (RMF) Version 1.0, which was the product of an open process involving stakeholder input via commentary and NIST-hosted workshops. This budget request includes $30 M for the U.S. Artificial Intelligence Safety Institute (USAISI) and $17 M for NIST's core AI research to advance research, standards, implementation, and testing.
- **Quantum Science (+$13.9M): -** NIST's world-leading expertise in quantum science, conducted with academic and industry partners, is furthering the development of new quantum measurement technologies upon which U.S. companies are building new businesses and services and contributing to the training of a growing U.S. quantum workforce.
- **Cybersecurity and Privacy:** NIST is Commerce's lead agency on cybersecurity issues. NIST's Cybersecurity and Privacy activities strengthen the security of our digital world through a portfolio that bridges foundational and applied cybersecurity research, and through the development of publicly available frameworks, standards, and technical guidance documents. NIST's sustained outreach supports the effective application of standards and best practices enabling the adoption of practical cybersecurity and privacy protections. Through internal research and collaboration with the private sector, academia, standards development organizations, other government agencies, and national and international stakeholders, NIST addresses the nation's current and future measurement science needs and is responsive to Congressional mandates and Executive Orders. NIST's FY25 budget proposal requests $96.8 million for these activities.
- **Advanced Communications:** NIST's Advanced Communications activities enable U.S. industry to develop and deploy secure, reliable, high-speed wireless and wireline communications systems that are critical to U.S. economic competitiveness, safety, and security. NIST's measurement science research, development of simulation tools and data sets, test bed construction, and support for the development of standards all serve to accelerate the deployment of next-generation communication technologies. These technologies will enable autonomous vehicles, advanced sensing systems, internet of things (IoT) applications, future Machine Learning (ML) systems, Artificial Intelligence (AI) systems, and public safety communications with enhanced capabilities such as

[12] U.S. Nuclear Regulatory Commission, NRC Issues Findings from NIST Reactor Event Special Inspection, NRC News Release No. 22-012 (Feb. 28, 2022), https://www.nrc.gov/reading-rm/doc-collections/news/2022/22-012.pdf
[13] U.S. Nuclear Regulatory Commission, NRC Authorizes Restart of National Institute of Standards and Technology Reactor, NRC News Release No. 23-021 (Mar. 10, 2023), https://www.nrc.gov/cdn/doc-collection-news/2023/23-021.pdf

mission-critical voice and location-based services. NIST is committed to solving the measurement and deployment challenges of these fast-moving fields to help the U.S. achieve and maintain global leadership in these areas. NIST's FY25 budget proposal requests $88.4 million for these activities.

- **National Construction Safety Team (NCST):** Established under the National Construction Safety Team Act, the NCST's primary mission is to investigate building failures and significant infrastructure disasters to understand their causes and to recommend improvements in codes, standards, and practices to enhance the safety and resilience of buildings and other structures.
- **Engineering Biology:** NIST is enabling the design and manufacture of biological systems, for products such as high-value pharmaceuticals and commodity chemicals, by developing advanced measurement capabilities from the molecular to the cellular system scale. NIST will continue to play a significant role in support of the U.S. bioeconomy through building next generation measurement science (biometrology) capabilities and engineering biology laboratories for accelerating responsible biotechnology innovations. NIST's FY25 budget proposal requests $39.8 million for these activities.

Industrial Technology Services (ITS)

In addition to the NIST laboratories, NIST manages several extramural programs supporting industry, including the Hollings Manufacturing Extension Partnership (MEP) program and the Manufacturing USA program. The FY25 budget request for Industrial Technology Services (ITS) is $212 million, which is the same as the FY24 level.[14]

Hollings Manufacturing Extension Partnership, +$0M
The FY25 NIST budget request for NIST's MEP is $175 million, which is the same as the FY24 level. NIST MEP is a public/private partnership run by Centers in all 50 states and Puerto Rico that provides technical assistance for small and medium-sized manufacturers (SMMs) to modernize their operations and adapt to foreign competition. MEPs provide resources in five key areas: technology acceleration, supplier development, sustainability, workforce, and continuous improvement. You can find information about your local MEP here.

MEP Centers are supported by s a combination of federal funds, state funds, and industry client fees. Continued federal support for MEP Centers remains a point of contention. As originally conceived, the centers were intended to become self-supporting after six years. The original legislation provided for a 50 percent federal cost-share for the first three years of operation, followed by declining levels of federal support for the final three years. In 1998, Congress eliminated the prohibition on federal funding after year six[15] and in 2017, Congress authorized NIST to provide up to 50 percent of the capital and annual operating and maintenance funds required to establish and support a center.[16] The 2020 CARES Act provided $50 million in supplemental support for the MEP program and waived the matching requirements. In addition, for the past several years, Centers have had the option to waive cost share for base funds due to

[14] U.S. Dep't of Com., NIST-NTIS-FY2025-Congressional-Budget-Submission.pdf (Mar. 2024).
[15] P.L. 105-277
[16] P.L. 114-329

appropriations language.[17]

The CHIPS and Science Act reauthorized the MEP program at $2.23 billion over five years.[18] The act also established a pilot program at MEP 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 can 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. Centers applying to the pilot program are not required to provide matching funding.

CHIPS and Science also directed MEP to establish 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.

In January 2023, NIST MEP released its 2023-2027 Strategic Plan.[19]

Manufacturing U.S.A. (a.k.a. NNMI), +$0M
The FY25 NIST budget request for Manufacturing USA is $37 million, which is the same as the FY24 level. In December 2014, Congress passed the Revitalize American Manufacturing and Innovation Act (RAMI), which established the National Network for Manufacturing Innovation program, which is now generally referred to as Manufacturing USA.[20] The CHIPS and Science Act authorized the Manufacturing USA Program at $829 million over 5 years. The program consists of a public-private network of 16 individual manufacturing Institutes that have unique technological concentrations, but also work in coordination to accelerate U.S. advanced manufacturing. The goals of the Institutes are to connect member organizations, work on major research and development collaboration projects to solve industry's toughest challenges, and train people on advanced manufacturing skills. NIST is responsible for coordinating the network of Institutes but currently only sponsors one - NIMBL (bio-pharmaceutical manufacturing). The Department of Energy and Department of Defense sponsor the other 15. The list of current institutes may be found here.

P.L. 117-328, the Consolidated Appropriations Act of 2023, provided an additional $14 million, which NIST is utilizing to stand up a new Manufacturing USA Institute. On March 12, 2024, a notice of intent was published seeking applicants for an AI-focused Manufacturing USA Institute.[21]

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[17] P.L. 117-328
[18] P.L. 117-167
[19] Nat'l Inst. Standards & Tech., MEP National Network 2023-2027 Strategic Plan (Jan. 2023), https://www.nist.gov/system/files/documents/2023/01/27/MEP_Strategic_2023-2027_plan_508_final.pdf
[20] P.L. 113-235
[21] Nat'l Inst. Standards & Tech., NIST to Launch Competition for AI-Focused Manufacturing USA Institute, https://www.nist.gov/news-events/news/2024/03/nist-launch-competition-ai-focused-manufacturing-usa-institute

In addition, the CHIPS and Science Act authorized up to three new Institutes focused on semiconductor manufacturing. NIST put out a request for information on developing these institutes, which closed in March 2023.[22] On May 6, 2024, a notice of funding opportunity was issued seeking proposals to establish a CHIPS Manufacturing USA Institute focused on digital twins for the semiconductor industry.[23]

Construction of Research Facilities

The Administration's FY25 budget request for the Construction of Research Facilities (CRF) is $311.5 million, an increase of $143.5 million or 85.4 percent over the FY4 level.[24] It should be noted that of the $168 million NIST received for CRF in FY24, $80.2 million was for Congressionally directed projects and provided $87.8 million for CRF activities. Additionally, in FY24 an additional $57.4 million of prior FY23 unobligated Safety, Capacity, Maintenance & Major Repairs (SCMMR) funds were available in FY24 to address a backlog of maintenance issues.

The aging and deteriorating buildings and infrastructure on its two campuses threaten NIST's ability to meet its mission. While some improvements have been made, the current lack of environmental control and failing infrastructure remain a serious impediment to NIST's ability to conduct advanced measurement science and research. A recent National Academies' report found that NIST's recapitalization plan is estimated between $300 million to $400 million in construction funding annually for the next 12 years.[25] Additional estimated funding of $120 million to $150 million per year is also needed to stabilize the effects of further deterioration. Numerous major utility infrastructure systems are currently in critical condition, creating risks of catastrophic failure of entire laboratory buildings.

CRF Budget Priorities

- **Construction and Major Renovations (CMR): Building 245 Modernization, +$178.3M:** The FY25 budget requests $178.3 million, an increase of $98.1 million over FY24, to complete the ongoing building 245 Modernization Project within the CMR portfolio. This includes funding to address significant cost increases due to rising construction prices, supply chain bottlenecks, as well as unexpected radiation and asbestos contamination.
- **Safety, Capacity, Maintenance & Major Repairs (SCMMR) of NIST Facilities, +$45.4M:** The FY25 budget requests $133.2 million, an increase of $45.5 million from FY24, to address NIST's most pressing utility infrastructure, safety and structural deficiencies facing existing buildings and building systems.

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[22] Nat'l Inst. Standards & Tech., Manufacturing USA Semiconductor Institute Request for Information (RFI) , https://www.nist.gov/oam/manufacturing-usa-semiconductor-institute-rfi.[6]

[23] U.S. Dep't of Commerce, CHIPS for America Announces $285 Million Funding Opportunity for a Digital Twin and Semiconductor CHIPS Manufacturing USA Institute (May 7, 2024), https://www.nist.gov/news-events/news/2024/05/chips-america-announces-285-million-funding-opportunity-digital-twin-and

[24] U.S. Dep't of Com., NIST-NTIS-FY2025-Congressional-Budget-Submission. (Mar. 2024).

[25] National Academies of Sciences, Engineering, and Medicine. 2023. *Technical Assessment of the Capital Facility Needs of the National Institute of Standards and Technology*. Washington, DC: The National Academies Press. https://doi.org/10.17226/26684.

CHIPS for America Program

The William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 (FY21 NDAA), Title XCIX, (P.L. 116-283)[26] contained various provisions intended to increase U.S. competitiveness in semiconductor design, manufacturing, and research, including:

- Authorizing the Secretary of Commerce to establish a program to provide financial assistance to incentivize investment in facilities and equipment in the U.S. related to semiconductor fabrication, assembly, testing, advanced packing, and research and development.
- Authorizing the Secretary, in collaboration with the Secretary of Defense, to establish a National Semiconductor Technology Center (NSTC) for the purpose of conducting research and prototyping of highly-advanced semiconductor technologies.
- Directing the Secretary of Commerce, through NIST, to create a National Advanced Package Manufacturing Program.
- Directing NIST to carry out a microelectronics research program to advance the state of chips- enabling technologies and materials.
- Authorizing NIST to establish a Manufacturing USA institute focused on semiconductor manufacturing.

However, the Act did not appropriate funds for the Department of Commerce and NIST to carry out these activities. In August 2022, President Biden signed the CHIPS and Science Act of 2022 into law, which provided $50 billion for the Department of Commerce, $39 billion for the semiconductors incentives program, and $11 billion for semiconductor research and development (R&D), to carry out the activities authorized by the FY21 NDAA and strengthen the U.S. position in semiconductor research, development, and manufacturing.[27] CHIPS and Science also clarified eligibility for the incentive program and included guardrails, prohibiting companies who accepted funds from building new manufacturing capacity of advanced semiconductors in countries of concern. Thus far, roughly $29.5 billion has been announced in grant awards and up to $25.1 billion in loans to eight companies across 17 projects in 11 states.[28] In February 2024, the Administration announced a $5 billion investment of the $11 billion available for semiconductor R&D through the NSTC and funding for workforce initiatives and other R&D programs.[29] The CHIPS Act also mandates a set-aside of $2 billion for projects focused on the production, packaging, or testing of chips manufactured at mature technology nodes. On April 15, 2024, Commerce Secretary Gina Raimondo stated she expects all the funds provided in the CHIPS Act to be allocated by the end of this year.[30]

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[26] P.L. 116-283

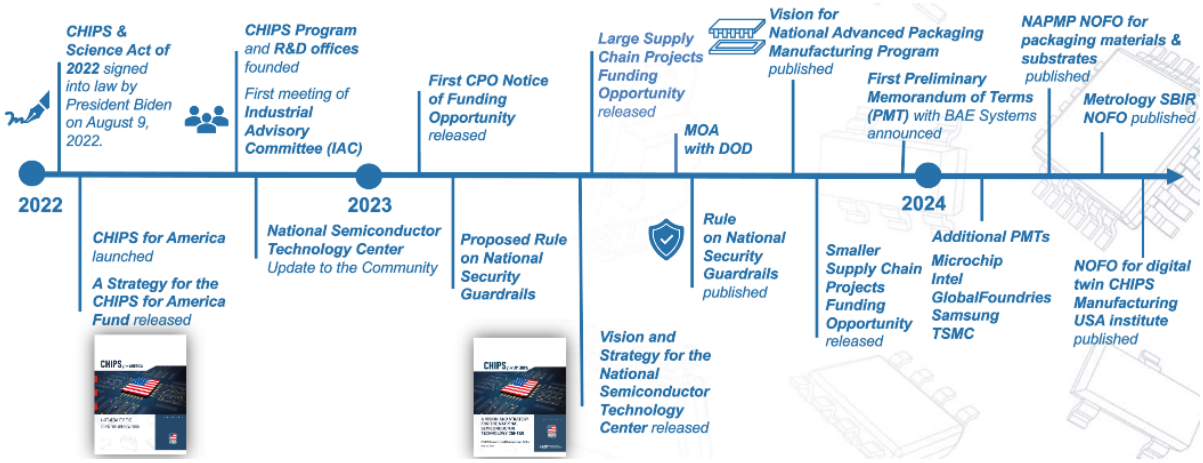
[27] P.L. 117-167

[28] Semiconductor Indus. Ass'n, CHIPS Incentives Awards (May 13, 2024), https://www.semiconductors.org/chips-incentives-awards/

[29] The White House, FACT SHEET: Biden-Harris Administration Announces Over $5 Billion from the CHIPS and Science Act for Research, Development, and Workforce, https://www.whitehouse.gov/briefing-room/statements-releases/2024/02/09/fact-sheet-biden-harris-administration-announces-over-5-billion-from-the-chips-and-science-act-for-research-development-and-workforce/

[30] Raimondo: Commerce Dept. will spend all of the CHIPS Act grant money this year, CNBC (Apr. 15, 2024),https://www.cnbc.com/2024/04/15/gina-raimondo-commerce-will-spend-all-chips-act-money-this-year.html#:~:text=The%20Biden%20administration%20will%20allocate,%2C%20and%20chemicals%2C%20Raimondo%20said.

Following its passage, the Secretary of Commerce tasked NIST with carrying out the bulk of CHIPS and Science activities.



CHIPS Implementation Timeline, U.S. Department of Commerce

CHIPS Incentives Program

CHIPS Program Office Funding

Original Funding in CHIPS & Science Act incl. FY24 Appropriations Updates
(no year funds, $M)

Program	FY22	FY23	FY24	FY25	FY26 Projected	5-Yr Total
Manufacuring Incentives	$18,620	$4,900	$3,400	$3,400	$4,400	$35,320
Secure Enclave			$1,500	$1,500	$500*	$3,500
Admin (incl. OIG)	$380	$100	$100	$100	$100	$780

*"up to $500M"

In February 2023, the CHIPS Program Office released the first funding opportunity, for projects that will construct, expand, and modernize of commercial facilities for the fabrication of leading-edge, current-generation, and mature-node semiconductors.[31]

In June 2023, NIST released its "Vision for Success: Facilities for Semiconductor Materials and Manufacturing Equipment"[32]. The "Vision for Success" builds off of the February 2023 funding opportunity and lays out goals across three categories: strengthening supply chain resilience, advancing U.S. technology leadership, and supporting vibrant U.S. fab clusters. The CHIPS Program Office aims to work with industry, U.S. partners and allies, U.S. government agencies, state and local entities, labor unions, workforce development organizations, career and technical education providers, economic development organizations, and institutions of higher education to achieve these goals by the end of this decade.

In September 2023, the CHIPS Program Office released its second funding opportunity to strengthen the resilience of the semiconductor supply chain, advance U.S. technology leadership, and support vibrant domestic semiconductor clusters. This funding opportunity specifically targeted small-scale supply chain projects with capital investments below $300 million.[33]

On April 16, 2024, the CHIPS Program Office released a funding opportunity for small businesses to explore the technical merit or feasibility of an innovative idea or technology for developing a viable product or service for introduction in the commercial microelectronics marketplace.[34] The CHIPS Program anticipates research projects across multiple topics for critically needed measurement services, tools, and instrumentation; innovative manufacturing metrologies; novel assurance and provenance technologies and advanced metrology research and development (R&D) testbeds to help secure U.S. leadership in the global semiconductor industry.

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[31] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., Biden-Harris Administration Launches First CHIPS for America Funding Opportunity (Feb. 3, 2024),https://www.nist.gov/news-events/news/2023/02/biden-harris-administration-launches-first-chips-america-funding

[32] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., Vision for Success: Facilities for Semiconductor Materials and Manufacturing Equipment (Apr. 13, 2024),https://www.nist.gov/chips/vision-success-facilities-semiconductor-materials-and-manufacturing-equipment

[33] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., Notice of Funding Opportunity: Small-Scale Supplier Projects (Apr. 29, 2024),https://www.nist.gov/chips/notice-funding-opportunity-small-scale-supplier-projects

[34] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., Notice of Funding Opportunity: CHIPS Metrology Program Small Business Innovation Research (SBIR) (May 14, 2024),https://www.nist.gov/chips/notice-funding-opportunity-chips-metrology-program-small-business-innovation-research-sbir

CHIPS R&D

No-Year Funding, by First Year of Availability ($M)

Program	FY22	FY23	FY24	FY25	4-Yr Total
NSTC	$1,960	$1,323	$1,100	$1,030	$5,413
NAPMP	$2,450	$490	$95	$0*	$3,035
Mfg USA	$100	$47	$50	$25	$222
Metrology	$390	$100	$29	$23	$542
Admin/OIG	$100	$40	$26	$22	$188
Total	$5,000	$2,000	$1,300	$1,100	$9,400

* FY25 allocates the $1.1 B appropriated into that fiscal year, but actual execution is based on the totals allocated from FY22 through FY24

In April 2023, NIST released its "Vision and Strategy for the National Semiconductor Technology Center (NSTC)".[35] In Novermeber 2023, it was announced that the National Center for the Advancement of Semiconductor Technology (Natcast) will run the NSTC and will be the organization center of a network of institutes, both public and private, to advance the state-of-the-art capacity for advanced semiconductor research, development, and design. The headquarters will house executive leadership of the center along with some in-house research, engineering, and other program capabilities. In January 2024, announced Deirdre Hanford as it's founing CEO of NAtcast.

In February 2024, the CHIPS Program Office announced $5 billion in expected investment for the NSTC and to formally establish a public-private consortium for the NSTC.[36] The center

[35] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., A Vision and Strategy for the National Semiconductor Technology Center (Apr. 28, 2024),https://www.nist.gov/chips/vision-and-strategy-national-semiconductor-technology-center

[36] U.S. Dep't of Commerce, Biden-Harris Administration Launches Next Phase for Over $5 Billion in CHIPS R&D Investments, Including the National Semiconductor Technology Center (NSTC) (Feb. 9, 2024),https://www.commerce.gov/news/press-releases/2024/02/biden-harris-administration-launches-next-phase-over-5-billion-chips-rd

will provide domestic access to advanced prototyping capabilities for the research and development community to advance new concepts and facilitate both the development and production of American technology on shore, energizing domestic manufacturing. Targeted research programs will deliver potentially disruptive and performance-enhancing capabilities. Faculty, students, and researchers will have access to experiential technical learning including state-of-the-art design environments and infrastructure, process design kits, and circuit design libraries to build the workforce needed to power manufacturing growth in the United States.

In November 2023, NIST released a Progress Report on "Building the U.S. Semiconductor Workforce"[37] The Progress Report outlines strategies to meet the vision of doubling the semiconductor workforce, tripling the number of graduates in semiconductor-related fields, training 100,000 new technicians, and launching semiconductor industry careers for underserved or underrepresented populations. The Progress Report outlines six strategies to achieve this vision: 1) catalyzing employer investment in the workforce; 2) encouraging high-quality jobs; 3) promoting state and local participation; 4) engaging community organizations, labor unions, industry, and academia; 5) leveraging research and development investments for workforce needs; and 6) expanding the workforce pipeline.

Also in November 2023, NIST released its "Vision for the National Advanced Packing Manufacturing Program (NAPMP)"[38]. That vision paper outlines the goals and investment areas to establish U.S. leadership in advanced packaging and provide the technology needed for domestic packaging manufacturing. The vision reveals top priority research investment areas and their interdependencies, including materials and substrates; advances in equipment, tools, and processes; power delivery and thermal management; photonics and connectors; the development of a chiplet ecosystem; and the co-design of these multi-chiplet subsystems with automated tools. On February 28, 2024, the CHIPS Program Office released a funding opportunity for R&D activities to establish and accelerate domestic capacity for advanced packaging substrates and substrate materials.[39]

On March 29, 2024, the CHIPS Program Office announced that it would not move forward with its third Notice of Funding Opportunity to construct, modernize, or expand commercial R&D facilities in the United States. The decision is a consequence of "overwhelming demand" for funding from the $39 billion facility incentive program, as well as program changes enacted through the final appropriations legislation for fiscal year 2024.[40]

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[37] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., Building the U.S. Semiconductor Workforce: CHIPS for America Progress Report (Nov. 3, 2023),https://www.nist.gov/system/files/documents/2023/11/03/Building-the-US-Semiconductor-Workforce.pdf

[38] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., The Vision for the National Advanced Packaging Manufacturing Program (Nov. 19, 2023),https://www.nist.gov/system/files/documents/2023/11/19/NAPMP-Vision-Paper-20231120.pdf

[39] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., Notice of Funding Opportunity: CHIPS National Advanced Packaging Manufacturing Program (NAPMP) Materials and Substrates Research and Development (May 8, 2024),https://www.nist.gov/chips/notice-funding-opportunity-chips-national-advanced-packaging-manufacturing-program-napmp

[40] Am. Inst. of Physics, CHIPS Program Suspends Plans for R&D Facility Funds (Apr. 5, 2024), https://ww2.aip.org/fyi/chips-program-suspends-plans-for-r-d-facility-funds#:~:text=The%20decision%20is%20a%20consequence,legislation%20for%20fiscal%20year%202024.

On May 5, 2024, the CHIPS Program Office released a funding opportunity for activities to establish and operate a CHIPS Manufacturing USA institute focused on digital twins for the semiconductor industry.[41] The CHIPS Manufacturing USA institute is expected to establish a shared facility where companies can experiment while protecting proprietary information; execute industry-relevant research projects; leverage shared facilities and technologies to enable diverse members to innovate at low cost; and participate in an education and workforce development program.

Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence

On October 30, 2023, the Administration issued Executive Order (EO) 14110 on *Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence*.[42] The EO establishes a government-wide effort to guide responsible AI development and deployment through federal agency leadership, regulation of industry, and engagement with international partners. The EO directs over 50 federal entities to engage in more than 100 specific actions to implement the guidance set forth across eight overarching policy areas.

NIST was tasked with the following responsibilities in the EO, most of which have a 270-day deadline:

- Develop a companion resource to the NIST AI Risk Management Framework for generative AI.
- Develop a companion resource to the NIST Secure Software Development Framework to incorporate secure-development practices for generative AI and dual-use foundation models.
- Launch a new initiative to create guidance and benchmarks for evaluating AI capabilities, with a focus on capabilities that could cause harm.
- Develop and help to ensure the availability of testing environments in coordination with the Department of Energy (DOE) and the National Science Foundation (NSF).
- Establish guidelines and processes – except for AI used as a component of a national security system – to enable developers of generative AI, especially dual-use foundation models, to conduct AI red-teaming tests to enable deployment of safe, secure, and trustworthy systems.
- Initiate an effort to engage with industry and relevant stakeholders to develop guidelines for possible use by synthetic nucleic acid sequence providers.
- Develop a report to the Director of the Office of Management and Budget (OMB) and the Assistant to the President for National Security Affairs identifying existing standards, tools, methods, and practices, as well as the potential development of further science-backed standards and techniques for authenticating, labeling or detecting

[41] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., CHIPS Manufacturing USA Institute (May 7, 2024), https://www.nist.gov/chips/research-development-programs/chips-manufacturing-usa-institute

[42] Presidential Executive Order on on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence The White House, https://www.whitehouse.gov/briefing-room/presidential-actions/2023/10/30/executive-order-on-the-safe-secure-and-trustworthy-development-and-use-of-artificial-intelligence/

synthetic content; preventing generative AI from producing child sexual abuse material or producing non-consensual intimate imagery of real individuals; and testing software for the above-mentioned purposes.

- Create guidelines for agencies to evaluate the efficacy of differential-privacy-guarantee protections, including for AI.
- Establish a plan for global engagement on promoting and developing AI standards.

Additional NIST Activities

- **Framework for Improving Critical Infrastructure Cybersecurity** – NIST created this voluntary framework in 2014 which enables organizations – regardless of size, degree of cybersecurity risk, or cybersecurity sophistication – to apply the principles and best practices of risk management to improving security and resilience.[43] In 2017 President Trump enacted an Executive Order requiring all Federal Agencies to adopt and implement the framework.[44] Given NIST is a non-regulatory agency, they have no means to ensure the adoption of the framework by Federal agencies. In January 2023, NIST released a Concept Paper with potential significant updates to the Framework to reflect the ever-evolving cybersecurity landscape and help organizations better manage cybersecurity risk.[45] In April 2023, NIST released an early preliminary draft of the 2.0 Core Framework[46] for feedback and then on February 26, 2024, NIST released version 2.0 of the Cybersecurity Framework.[47]
- **Framework for Artificial Intelligence Risk Management (A.I. RMF)** – After direction from Congress in the National AI Initiative, NIST worked through a consensus-driven, open, collaborative, and transparent process to develop the AI RMF. NIST launched this voluntary framework in January 2023 which enables organizations to better mitigate risks associated with AI and incorporate trustworthiness into the design, development, use, and evaluation of AI products, services, and systems.[48] In March 2023, NIST launched the Trustworthiness and Responsible AI Resource Center, which will help facilitate the implementation of and alignment of the AI RMF.[49] On April 29, 2024, NIST released a draft publication based on

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[43] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., NIST Releases Cybersecurity Framework Version 1.0 (Feb. 12, 2014), https://www.nist.gov/news-events/news/2014/02/nist-releases-cybersecurity-framework-version-10

[44] Presidential Executive Order on Strengthening the Cybersecurity of Federal Networks and Critical Infrastructure The White House, https://trumpwhitehouse.archives.gov/presidential-actions/presidential-executive-order-strengthening-cybersecurity-federal-networks-critical-infrastructure/

[45] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., NIST Cybersecurity Framework 2.0 Concept Paper: Potential Significant Updates to the CSF (Jan. 19, 2023), https://www.nist.gov/system/files/documents/2023/01/19/CSF_2.0_Concept_Paper_01-18-23.pdf

[46] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., NIST Cybersecurity Framework 2.0 Core Discussion Draft (Apr. 2023), https://www.nist.gov/system/files/documents/2023/04/24/NIST%20Cybersecurity%20Framework%202.0%20Core%20Discussion%20Draft%204-2023%20final.pdf

[47] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., NIST Releases Version 2.0 of Landmark Cybersecurity Framework (Mar. 29, 2024), https://www.nist.gov/news-events/news/2024/02/nist-releases-version-20-landmark-cybersecurity-framework

[48] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., Artificial Intelligence Risk Management Framework (AI RMF 1.0) (Jan. 2023),https://nvlpubs.nist.gov/nistpubs/ai/NIST.AI.100-1.pdf

[49] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., NIST Trustworthy & Responsible Artificial Intelligence Resource Center (Apr. 30, 2024),https://airc.nist.gov/Home

the AI RMF to help manage the risk of generative AI.[50]

- **U.S. Artificial Intelligence Safety Institute (USAISI)** – On November 1, 2023, the Administration announced the establishment of the United States Artificial Intelligence Safety Institute (USAISI) within NIST.[51] The USAISI will pursue a range of projects, which will initially include advancing research and measurement science for AI safety, conducting safety evaluations of models and systems, and developing guidelines for evaluations and risk mitigations, including content authentication and the detection of synthetic content.
  On December 14, 2023, Full Committee Chairman Lucas and Ranking Member Lofgren; Research and Technology Subcommittee Chairman Collins and Ranking Member Stevens; and Subcommittee on Investigations and Oversight Chairman Obernolte and Foushee sent NIST a letter regarding the lack of transparency and commitment to scientific merit for what was to be external research awarded through the USAISI.[52] There are additional concerns around the timeline pressures the Administration has placed on NIST and the Committee believes this work should not be rushed at the expense of doing it right.
  On February 8, 2024, the Department of Commerce announced the establishment of the USAISI Consortium to support the USAISI.[53] The Consortium will contribute to activities outlined in EO 14110, including developing guidelines for red-teaming, capability evaluations, risk management, safety and security, and watermarking synthetic content.
- **NIST Center of Excellence Program** – The NIST Center of Excellence Program supports collaborations between NIST and leading research institutes in emerging technology areas to expand NIST's impact and mission delivery through strategic partnerships with the country's foremost experts in critical areas.[54] Currently, NIST supports three Centers of Excellence in Advanced Materials, Community Resilience, and Forensic Science.
- **International Standards** – NIST's research supports the development of technical standards that are crucial to drive innovation and applications. Over 400 NIST staff participate in international standards activities as technical experts and in leadership roles. Standards underpin every aspect of our daily lives, from enabling communication technologies such as Bluetooth and WiFi to ensuring the safety of devices such as pacemakers and step ladders. They promote confidence in the performance of products and enable international trade. The standards leadership and expertise provided by NIST is an essential element of a broader

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[50] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., Artificial Intelligence Risk Management Framework: Generative Artificial Intelligence Profile (Apr. 2024),https://airc.nist.gov/docs/NIST.AI.600-1.GenAI-Profile.ipd.pdf
[51] U.S. Dep't of Commerce, At the Direction of President Biden, Department of Commerce to Establish U.S. Artificial Intelligence Safety Institute to Lead Efforts on AI Safety (Nov. 2, 2023),https://www.commerce.gov/news/press-releases/2023/11/direction-president-biden-department-commerce-establish-us-artificial
[52] House Comm. on Sci., Space, & Tech., Science Committee Leaders Stress Importance of Diligence in NIST AI Safety Research Funding (Apr. 16, 2024),https://science.house.gov/2023/12/science-committee-leaders-stress-importance-of-diligence-in-nist-ai-safety-research-funding
[53] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., Biden-Harris Administration Announces First-Ever Consortium Dedicated to AI Safety (Mar. 29, 2024),https://www.nist.gov/news-events/news/2024/02/biden-harris-administration-announces-first-ever-consortium-dedicated-ai
[54] U.S. Dep't of Commerce, Nat'l Inst. Standards & Tech., Centers of Excellence (Apr. 2, 2024),https://www.nist.gov/coe

U.S. strategy to ensure our global competitiveness. In May 2023, the White House announced the "United States Government's National Standards Strategy for Critical and Emerging Technology,"[55] NIST has been placed in charge of implementing the strategy, which is intended to help accelerate private sector-led standards efforts for critical and emerging technologies (CETs), contribute to interoperability, facilitate access to global markets, and ensure U.S. competitiveness and innovation.

Additional Reading Material

- Department of Commerce FY2025 Budget in Brief
- NIST Budget Justification to Congress
- NIST Budget Summary
- Department of Commerce Strategic Plan 2022-2026
- National Academies Report *"Technical Assessment of the Capital Facility Needs of the National Institute of Standards and Technology"*

[55] The White House, United States Government National Standards Strategy for Critical and Emerging Technology (May 2023),https://www.whitehouse.gov/wp-content/uploads/2023/05/US-Gov-National-Standards-Strategy-2023.pdf