PRESIDENT'S FY 2021 BUDGET REQUEST TO CONGRESS

FOR THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

National Institute of Standards and Technology
U.S. Department of Commerce

Letter from the Director

Since its founding nearly 120 years ago, the National Institute of Standards and Technology (NIST) has continually advanced to solve the most pressing measurement and technical challenges the nation has faced. From helping to standardize methods and materials for mass production techniques introduced during World War I to the invention of the world's first atomic clock to the breakthroughs that opened the door to quantum computing, NIST has been at the leading edge of research and engineering for U.S. industry and innovation. Today, NIST is providing measurement tools and standards to strengthen our nation's competitiveness and economic security in areas that affect Americans' daily lives.

I am proud to lead this organization and to represent its talented, dedicated staff, who every day advance the frontiers of a broad portfolio of science and technology. This past year, NIST has published important research and guidance on topics such as privacy, artificial intelligence and facial recognition, cybersecurity, advanced communications and the internet of things, advanced manufacturing, quantum science and technology, engineering biology, disaster resilience, measurement science, and many other fields.

This budget request supports NIST's strengths — paving the way to tomorrow's Industries of the Future — with special emphasis on artificial intelligence (AI). NIST is a key contributor in AI, participating in interagency coordination and building the foundation for trustworthy AI. Last year, in response to an Executive Order, we provided a plan for federal engagement in the development of AI standards. Our research focuses on enhancing the security and explainability of AI, and the development of tools and standards that will further innovation.

In addition to AI, we will focus on advancing the frontiers of quantum information science, 5G and advanced communications, advanced manufacturing, and biotechnology. These science and technology domains have the potential to globally transform manufacturing, communications, health care, transportation, computation and more. These areas also present NIST with new challenges and opportunities to develop novel measurement capabilities and technologies toward U.S. leadership in the Industries of the Future, and to protect the nation's economic and national security.

NIST is also leading a national initiative, in coordination with all federal science and technology agencies, to modernize how we transfer technologies arising from federally funded research at the nation's research institutes and universities. We are advancing efforts based on the findings in the 2019 NIST Green Paper to dramatically enhance our nation's returns on investment from the $175+ billion of federally funded research each year. In this era of global competition, it is imperative that the U.S. derives for our citizens even greater value from the nation's research enterprise.

Sincerely,

Dr. Walter G. Copan
Under Secretary of Commerce for Standards and Technology & Director, National Institute of Standards and Technology

Introduction

The National Institute of Standards and Technology (NIST) promotes U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology. For more than 115 years, NIST has maintained the national standards of measurement, a role that the U.S. Constitution assigns to the federal government to ensure fairness in the marketplace.

This budget request is consistent with the administration's priorities to redirect domestic discretionary resources to rebuild the military and make critical investments in the nation's security and to keep the nation on a responsible fiscal path.

The **Scientific and Technical Research and Services (STRS)** account funds NIST's Laboratory Programs. Because technology discovery, refinement, and commercialization rely on the ability to measure key attributes, NIST's Laboratory Programs offer measurement research and services that are central to American innovation, productivity, trade, national security, and public safety. NIST's research priorities are directly aligned with advancing U.S. leadership in the Industries of the Future highlighted by President Trump: quantum science, AI, 5G/advanced communications, advanced manufacturing, and the bioeconomy.

The **Industrial Technology Services (ITS)** account supports NIST's extramural programs. Manufacturing USA creates robust research infrastructure for U.S. industry and academia to solve industry-relevant problems. The budget request discontinues federal funding for the Manufacturing Extension Partnership program.

The **Construction of Research Facilities (CRF)** account funds the maintenance, repair, improvements, and major renovation of NIST facilities. While some progress has been made, the current state of NIST's facilities and failing infrastructure remain a serious concern to NIST's ability to deliver its mission.

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NIST computer scientist Jenise Reyes-Rodriguez tests a method for acquiring digital evidence from damaged cell phones. NIST's Computer Forensic Tool Testing (CFTT) program supports the law enforcement and digital forensics communities by helping to ensure that their tools and methods produce accurate and reliable results.

Credit R. Press/NIST

Scientific and Technical Research and Services

The NIST research programs work at the frontiers of measurement science to ensure that the U.S. system of measurements is firmly grounded in sound scientific and technical principles. Today, the NIST laboratories address increasingly complex measurement challenges, ranging from the very small (nanoscale devices for advanced computing) to the very large (vehicles and buildings), and from the physical (resilient infrastructure) to the virtual (cybersecurity and data science). As new technologies develop and evolve, NIST's measurement research and services remain central to national defense, homeland security, trade, and innovation.

NIST's Scientific and Technical Research and Services (STRS) activities provide industry, academia, and other federal agencies with world-class research capabilities in measurement science that form the foundation of the global system of weights and measures and enable innovation. They supply basic and applied measurements, calibrations, and standards that impact every aspect of our economy and lives, from the accuracy of airplane altimeters to the reliability of clinical measurements and the strength of the encryption technologies that protect our digital lives and businesses. They lend unbiased technical support to the development of open, industry-led and consensus-based documentary standards and specifications driving the deployment of advanced technologies and facilitating global commerce. NIST offers unique, cutting-edge user facilities that annually help more than 3,000 scientists from academia and industry advance the state of the art in nanotechnology, bioscience, advanced materials, and other emerging technology areas.

Since its founding more than a century ago, NIST has sought to solve the most pressing measurement and technical challenges the nation has faced. From helping to standardize methods and materials for mass production techniques introduced during World War I to studying the collapse of the World Trade Center buildings on 9/11, NIST has sought to advance U.S. industry and security through measurement science and standards. NIST continues to provide measurement tools and standards that strengthen U.S. competitiveness and security in areas affecting Americans' daily lives.

The STRS account contains three line items: Laboratory Programs (LP), Corporate Services (CS), and Standards Coordination and Special Programs (SC-SP). To add more transparency beyond the STRS budget line item level, NIST is providing budget information by mission space as described on the following pages.

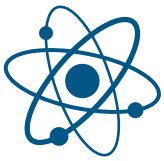
Note: Totals in budget tables may not add due to rounding.

"We are working to ensure a future in which American innovation, American values, and the American workforce continue to inspire and lead the world."

– Kelvin K. Droegemeier, Director of the White House Office of Science and Technology Policy

Strategic Focus Areas — Investing for the Long Term

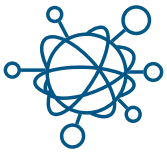
Throughout its history, NIST has provided new industries with foundational measurement tools that enhance reproducibility, interoperability, and reliability to accelerate innovation, adoption, and impact. This budget request maintains a focus on developing capabilities in four areas where NIST's ability to provide a strong technical foundation may determine the future of U.S. leadership:



Quantum Science: 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 can build new businesses and services.

Artificial Intelligence: NIST is developing measurements and data that address the performance and reliability of AI systems to accelerate their widespread adoption and allow the nation to realize the potential economic, societal, and innovation benefits that AI systems offer.

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.



Internet of Things: NIST is leveraging its expertise in advanced communications, manufacturing systems, cybersecurity, and more to develop testing tools, best practices, and standards that support the widespread deployment of safe and reliable internet of things (IoT) technologies and applications.

NIST's research supports the development of technical standards that are crucial to drive innovation and applications. More than 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 U.S. effort to lead in the emerging technologies that will define the 21st century economy.

"The Trump Administration continues to prioritize the technologies that power Industries of the Future (IotF). These industries promise to fuel American prosperity, improve quality of life and national security, and create high-paying jobs for American workers."

– Fiscal Year 2021 Administration Research and Development Budget Priorities

NIST scientist David Ross programs the software that controls NIST's Living Measurement Systems Foundry, which provides a new level of automation in biological experimentation. This work is a part of a larger NIST effort to accelerate the design of safe and reliable biologically related processes and products for public benefit in materials manufacturing, medicine, sustainable energy, and agriculture.

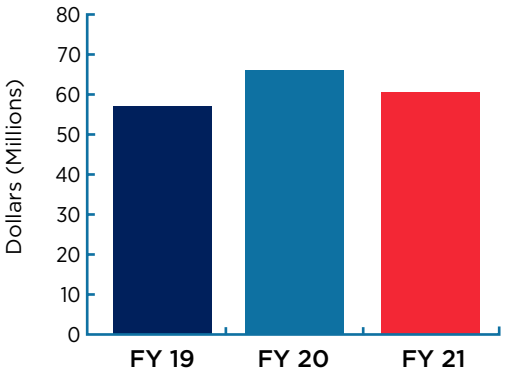
Credit: B. Hayes/NIST

Advanced Communications, Networks and Scientific Data Systems

NIST's Advanced Communications, Networks, and Scientific Data Systems activities constitute a significant portion of NIST's work relevant to the Industries of the Future, specifically in the areas of 5G/advanced communications and AI. NIST programs enable secure, reliable, high-speed wireless and wireline communications critical to U.S. economic competitiveness, safety, and security. NIST measurement science research and support for the development of standards accelerates the deployment of next-generation communication technologies, including 5G, a term used to describe emerging wireless networks that will be faster and more reliable than today's networks. These technologies will be necessary for self-driving cars, IoT applications, drones, and AI systems. 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.

This request funds measurement science research and standards development with an emphasis on AI and 5G communications, two of the Industries of the Future. NIST will consolidate efforts on its highest priority capabilities and research.

Budget Request



FY 2019 Enacted: **$57.0 M**
Lab Programs: $55.6 M
Corp Serv: $0.0
SC-SP: $1.4 M

FY 2020 Enacted: **$67.5 M**
Lab Programs: $66.1 M
Corp Serv: $0.0
SC-SP: $1.4 M

FY 2021 Requested: **$60.6 M (-10.2%)**
Lab Programs: $59.6 M
Corp Serv: $0.0
SC-SP: $0.9 M

Note: The FY 2021 request includes $1.9 million to fund inflationary adjustments.

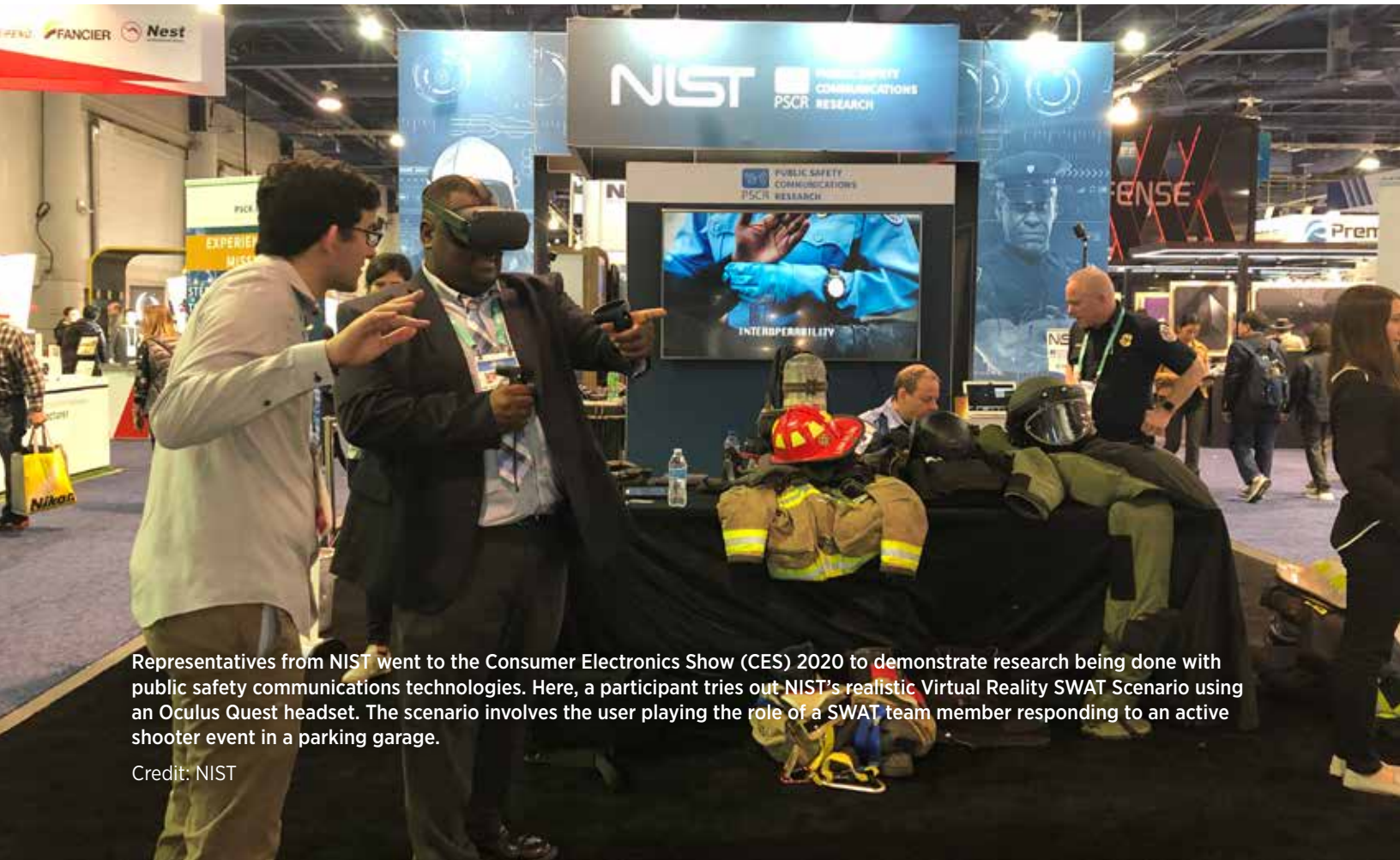
Illustrative program changes:

- **+$25.0 million** for measurement tools and testbeds to accelerate the development and adoption of interoperable, secure, and reliable AI technologies. This increase brings the total FY 2021 request to $48.9 million for AI.
- **+$1.0 million** to accelerate efforts to develop position, navigation, and timing profiles that strengthen national resilience by leveraging the NIST Cybersecurity Framework and working with the public and private sectors.
- **+1.4 million** to support a prominent U.S. role in standards development efforts for 5G that will underpin the success and wide deployment of 5G technologies.
- **-$36.2 million** eliminating programs addressing multiple IT and data challenges, including medical record interoperability, voting technologies, data visualization, and smart grid interoperability.

Program Highlights

The future global economy requires reliable and readily available communication capabilities that can meet skyrocketing demand for wireless data. NIST will continue to pioneer measurement science and standards for secure advanced communications, networks, and data to ensure U.S. leadership in these technologies. For example:

- In response to a February 2019 Executive Order (13859), NIST released a plan entitled "U.S. Leadership in AI: A Plan for Federal Engagement in Developing Technical Standards and Related Tools." The plan, developed with extensive public and private sector input, offers federal guidance for AI standards development and coordination, promotes focused research on the trustworthiness of AI, calls for expansion of public-private partnerships to advance AI, and highlights related tools needed to support AI such as benchmarks. NIST is addressing these knowledge gaps through focused research efforts and robust stakeholder engagement.
- The 5G Millimeter-Wave Channel Model Alliance, sponsored by NIST, provides a forum for industry, academia, and government to work on breakthrough approaches that promote effective use of this wavelength spectrum, a key enabler for applications related to the IoT and widespread deployment of 5G networks.
- The National Advanced Spectrum and Communications Test Network (NASCTN) is a national network of federal, academic, and commercial test facilities that provides the testing, modeling, and analysis needed to develop and deploy spectrum-sharing technologies.
- NIST developed deep learning algorithms that perform better than traditional methods to detect when offshore radars are operating. This information is critical to enabling companies to employ the commonly termed "3.5 Gigahertz Band" when it is not needed for its primary use by the U.S. Navy. Private sector access to this band will expand product markets and give end users better coverage and higher data rate speeds.



Representatives from NIST went to the Consumer Electronics Show (CES) 2020 to demonstrate research being done with public safety communications technologies. Here, a participant tries out NIST's realistic Virtual Reality SWAT Scenario using an Oculus Quest headset. The scenario involves the user playing the role of a SWAT team member responding to an active shooter event in a parking garage.

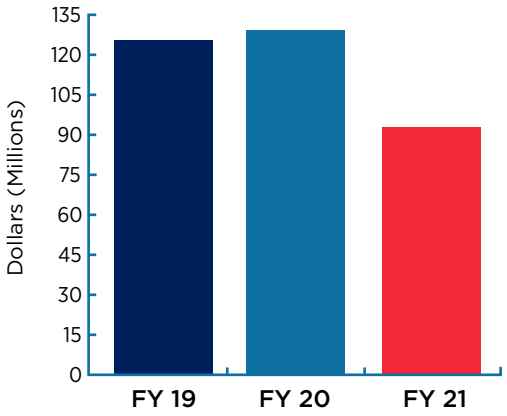
Credit: NIST

Advanced Manufacturing and Material Measurements

NIST has partnered with the U.S. manufacturing sector for more than a century and has a proven track record of delivering the tools and technical expertise that existing manufacturers and aspiring start-ups need. NIST's Advanced Manufacturing and Material Measurements activities provide industry with precision measurement technologies, tests, protocols, trusted systems, and world-class scientific and engineering knowledge through targeted research across a broad portfolio — including advanced materials development, advanced sensing, biomanufacturing, and smart manufacturing systems. NIST's efforts are directly aligned with the R&D priorities targeting the Industries of the Future and support the Administration's "Strategy for American Leadership in Advanced Manufacturing" by enabling the development of a strong U.S. manufacturing base that is essential to our economic and national security.

NIST requests funds to continue its efforts to ensure the U.S. remains a competitive force in advanced manufacturing, ensuring economic and national security.

Budget Request



FY 2019 Enacted: **$127.0 M**
Lab Programs: $111.4 M
Corp Serv: $12.5 M
SC-SP: $3.0 M

FY 2020 Enacted: **$131.2 M**
Lab Programs: $115.6 M
Corp Serv: $12.5 M
SC-SP: $3.0 M

FY 2021 Requested: **$92.5 M (-29.5%)**
Lab Programs: $82.3 M
Corp Serv: $8.1 M
SC-SP: $2.1 M

Note: The FY 2021 request includes $4.8 million to fund inflationary adjustments.

Illustrative program changes:

- **-$43.5 million** terminating NIST's efforts addressing structural materials challenges, including reliability testing for bridges and pipelines, body armor testing, and trace materials detection. NIST will cease operation of its beamlines at Brookhaven National Laboratory, ending a decades-long investment in leading-edge materials characterization instruments, and will not support multiple standard reference materials and standard reference datasets for U.S. chemical and steel industries. NIST will eliminate funding for the Advanced Materials Center of Excellence led by Northwestern University and stop work on energy and environmental applications, including the termination of grants supporting the recycling and reuse of plastics.

NIST materials research engineer Marcos Reyes-Martinez examines how new, innovative architectured foam-like materials change shape when compressed or impacted. The material's network structure was designed by a computer, using advanced 3D printing algorithms, so that it does not expand laterally when compressed. This unusual response in a soft elastomer has significant potential in energy absorbing applications like helmets for football and other sports as well as personal protective equipment for our nation's first responders and soldiers.

Credit: J. Stoughton/NIST

Program Highlights

NIST's measurement research in manufacturing processes and advanced materials provides the foundation for the nation's manufacturers to innovate, invent, and create new products and services more rapidly and more efficiently than their competitors around the world. For example:

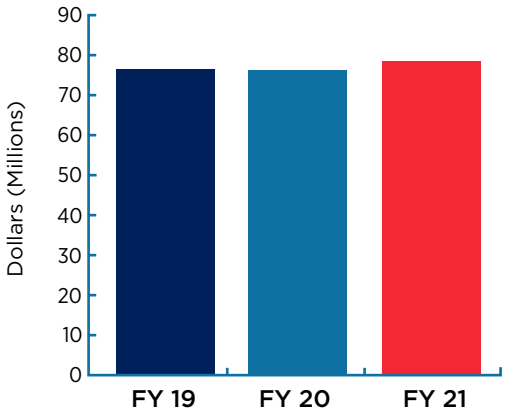
- To ensure U.S. industry can take advantage of the latest manufacturing robotics technologies, NIST is developing standards and test methods, including new ways to teach robots a manufacturing task so that more time is spent on producing than programming, and creating benchmarks for robot performance on the factory floor for tasks such as grasping objects with human-like dexterity.
- NIST partners with the pharmaceutical industry to develop widely available reference materials and measurement methods. For example, NIST's monoclonal antibody reference material provides a benchmark for companies to ensure quality measurements of their manufactured biological drugs and to spur biopharmaceutical innovations.
- NIST is developing approaches to overcoming technical barriers to the widespread adoption of additive manufacturing (also known as 3D printing) by quantifying uncertainties in measuring feedstock materials, developing methods to evaluate machines and the parts they produce, testing new methods of real-time monitoring and control, and generating high quality data to help validate process models and simulations.
- The NIST Model-Based Enterprise program is developing tools for today's manufacturing technologies to be integrated with system and process models that enable companies to be agile and flexible. Using models to link different elements in the production lifecycle will allow manufacturers to make better decisions and deliver higher-quality products.

Cybersecurity and Privacy

NIST's Cybersecurity and Privacy activities strengthen the security of our digital world through a portfolio bridging foundational and applied cybersecurity research, and through the development of publicly available standards and technical guidance. NIST's sustained outreach supports the effective application of standards and best practices, enabling the adoption of practical cybersecurity and privacy approaches. 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 and administration priorities.

NIST requests funds to strengthen the security of the digital systems upon which the nation's critical infrastructure is built.

Budget Request



Note: The FY 2021 request includes $2.6 million to fund inflationary adjustments

FY 2019 Enacted: **$77.5 M**
Lab Programs: $75.6 M
Corp Serv: $0.0
SC-SP: $1.9 M

FY 2020 Enacted: **$77.5 M**
Lab Programs: $75.6 M
Corp Serv: $0.0
SC-SP: $1.9 M

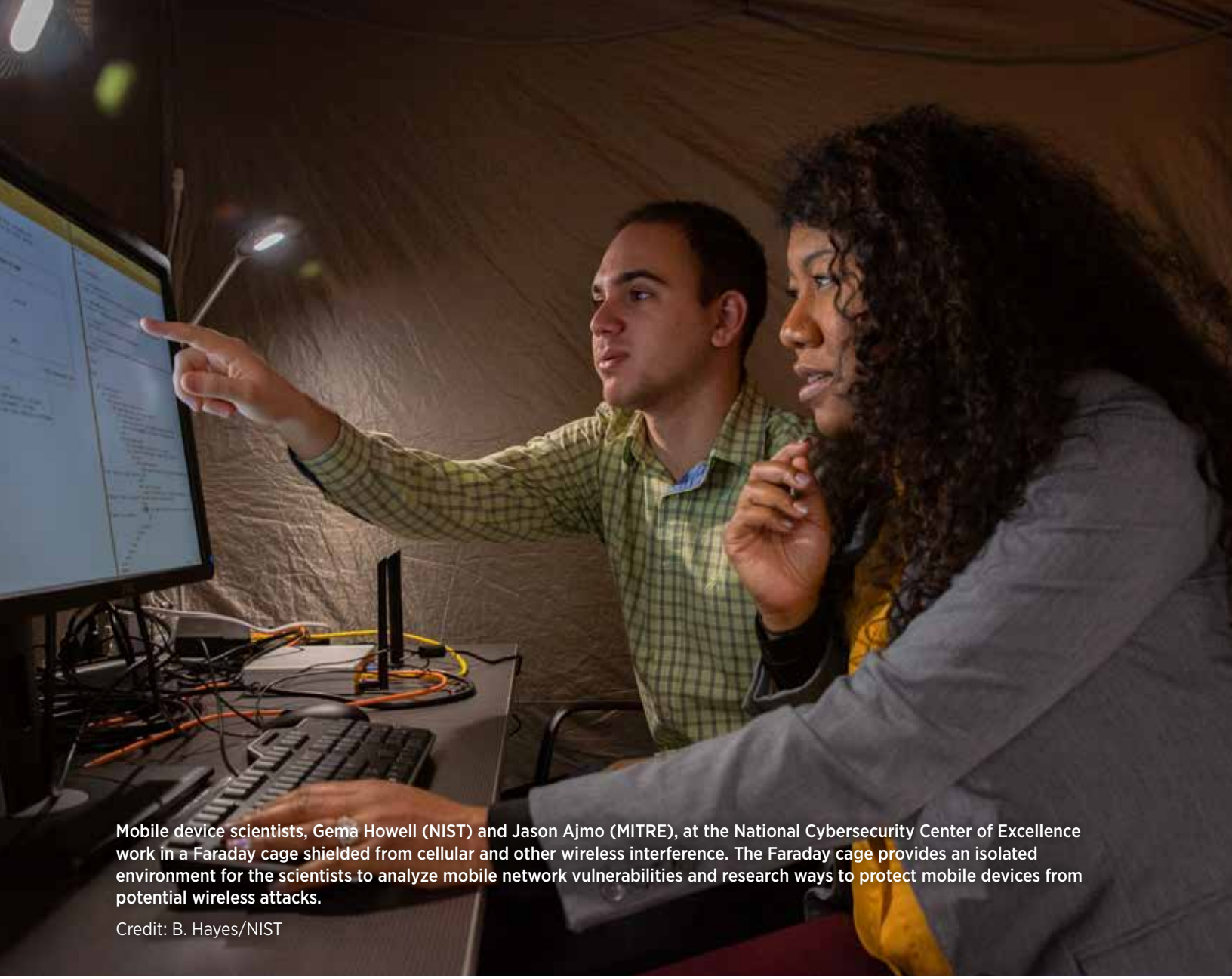
FY 2021 Requested: **$79.4 M (+2.5%)**
Lab Programs: $78.1 M
Corp Serv: $0.0
SC-SP: $1.3 M

No major program changes.

Program Highlights

The federal government, critical infrastructure sectors, and all Americans increasingly depend on cyberspace. At the same time, the threats posed by criminals, certain governments, and terrorists are growing in frequency and impact in an increasingly complex landscape. NIST helps our partners in the private sector, academia, and government manage their risks and ensure our digital ecosystems can be sources of innovation and growth. For example:

- NIST's Cybersecurity for the Internet of Things program is developing technical resources to improve the cybersecurity of connected devices and the environments in which they are deployed. NIST publications can help IoT device manufacturers understand the cybersecurity risks their customers face and learn to manage these risks while enabling innovation.



Mobile device scientists, Gema Howell (NIST) and Jason Ajmo (MITRE), at the National Cybersecurity Center of Excellence work in a Faraday cage shielded from cellular and other wireless interference. The Faraday cage provides an isolated environment for the scientists to analyze mobile network vulnerabilities and research ways to protect mobile devices from potential wireless attacks.

Credit: B. Hayes/NIST

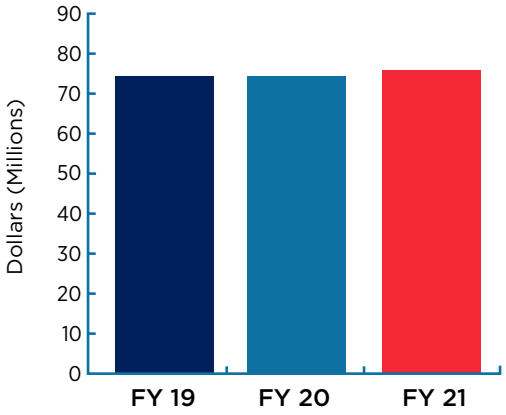
- NIST issued a report outlining the use of blockchain technology as a model to provide tamper-proof transmission of manufacturing data and allow data traceability to all participants in the production process. Using three different industrial sectors, NIST generated test cases showing how the use of blockchain could ensure the cybersecurity of each scenario. Building on this effort, NIST will work with collaborators to advance and promote the use of blockchain for smart manufacturing and secure supply chains.
- NIST is building a toolbox of privacy engineering approaches to address the nation's evolving privacy needs, particularly the sharing of personal information with software tools across the internet and through social media. With robust stakeholder engagement, NIST has developed a voluntary privacy framework to help organizations build customer trust, meet their compliance obligations, and communicate their privacy practices effectively.
- The National Initiative for Cybersecurity Education (NICE), led by NIST, is a partnership with government, academia, and industry focused on cybersecurity education, training, and workforce development. NICE participates in a range of conferences and provides resources through webinars and other online tools to increase awareness of learning and career opportunities to promote a skilled, diverse cybersecurity workforce in the U.S.

Exploratory Measurement Science

NIST's mission requires deep expertise in a broad range of disciplines. To best position NIST to support U.S. technological interests well into the future, it is essential that NIST maintain a portfolio of exploratory measurement science research. This portfolio includes investing in higher-risk and potentially transformative projects selected in a competitive internal process and the NIST National Research Council Postdoctoral Research Associateship Program that brings researchers of exceptional promise to NIST.

NIST requests funds to develop the next generation of cutting-edge measurement tools and technologies.

Budget Request



Note: The FY 2021 request includes $2.7 million to fund inflationary adjustments.

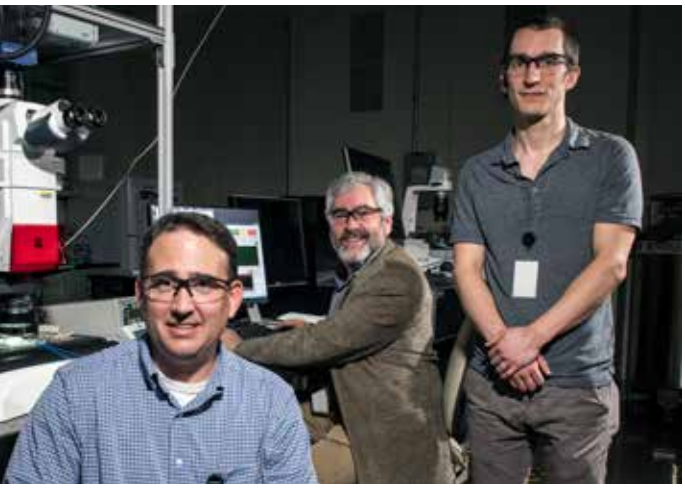
FY 2019 Enacted: **$75.4 M**
Lab Programs: $71.6 M
Corp Serv: $2.0 M
SC-SP: $1.8 M

FY 2020 Enacted: **$75.4 M**
Lab Programs: $71.6 M
Corp Serv: $2.0 M
SC-SP: $1.8 M

FY 2021 Requested: **$75.5 M (+0.1%)**
Lab Programs: $74.1 M
Corp Serv: $0.2 M
SC-SP: $1.2 M

Illustrative program changes:

- **-$2.6 million** terminating supplementary Strategic and Emerging Research Initiatives funding to support the Joint Initiative for Metrology in Biology (JIMB), a partnership with SLAC and Stanford University.



Greg Cooksey, Paul Patrone and Anthony Kearsley were part of a team that recently received funding via NIST's Innovations in Measurement Sciences program.

Credit: NIST

Program Highlights

NIST's exploratory research accelerates innovation in emerging areas. For example:

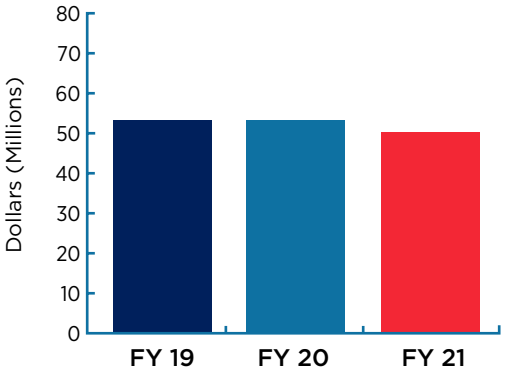
- A National Research Council Postdoctoral Associate was an integral part of a team that created the world's first network of optical atomic clocks using both fiber optic and free space connections, a major advance toward creating international timekeeping based on optical clocks with 100-fold greater accuracy and stability than current microwave clock standards.
- Uniting NIST expertise in wireless communications, manufacturing, and AI, a team of NIST researchers is creating the first repeatable, over-the-air testbed for dynamic wireless systems in an industrial environment. Using an innovative array of quantum probes, the team is developing methods to enable U.S. industry to train and verify its wireless Industrial Internet of Things technologies and networks.

NIST User Facilities

NIST operates two unique and valuable user facilities that provide U.S. scientists with access to cutting-edge expertise and capabilities to perform innovative research beyond the reach of the user's own laboratory. The NIST Center for Neutron Research (NCNR) features world-class neutron instrumentation and expertise in the development and application of neutron measurement technologies. The Center for Nanoscale Science and Technology (CNST) provides users rapid access to state-of-the-art tools needed to fabricate and characterize nanoscale structures, devices, and materials.

NIST requests funds to provide unique measurement and research capabilities to U.S. scientists.

Budget Request



FY 2019 Enacted: **$53.7 M**
Lab Programs: $52.4 M
Corp Serv: $0.0
SC-SP: $1.3 M

FY 2020 Enacted: **$53.7 M**
Lab Programs: $52.4 M
Corp Serv: $0.0
SC-SP: $1.3 M

FY 2021 Requested: **$50.0 M (-6.9%)**
Lab Programs: $49.1 M
Corp Serv: $0.0
SC-SP: $0.9 M

Note: The FY 2021 request includes $1.7 million to fund inflationary adjustments.

NCNR user Kate Ross from Colorado State University prepares to to analyze a sample of a potential spin liquid material in the main hall at the NIST Center for Neutron Research.

Credit: F. Webber/NIST

Illustrative program changes:

- **-$5.4 million** reducing services at the NCNR, including ceasing operation of two neutron scattering instruments and decreasing funding for reactor maintenance, resulting in the loss of at least 200 research participants annually and a potential increase in unscheduled reactor shutdowns.

Program Highlights

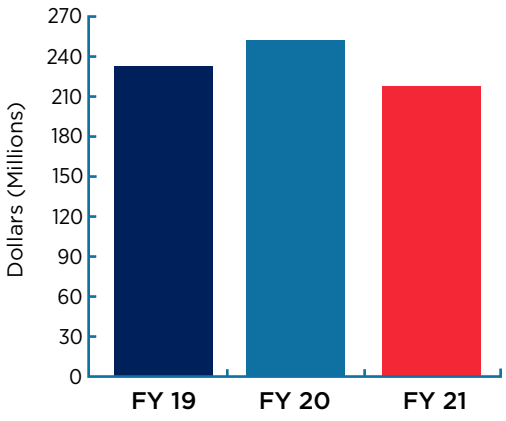
- The NIST user facilities provide researchers from across the country with access to state-of-the-art instrumentation to meet their needs in neutron scattering and nanofabrication.
- Recent updates and maintenance allow NIST user facilities to continue to provide safe, reliable operations and robust user support.
- Serving more than 85 U.S. companies annually, the NIST user facilities continue to evolve to ensure that their capabilities meet the needs of the U.S. scientific community.

Fundamental Measurement, Quantum Science and Measurement Dissemination

NIST's Laboratory Programs work at the frontiers of measurement science to ensure the U.S. system of measurements is firmly grounded on sound scientific and technical principles. NIST determines the definitive methods for nearly every kind of measurement employed in commerce and research and disseminates standards and best practices central to innovation, productivity, trade, national security, and public safety. This request supports core programs advancing the precision, accuracy, and comparability of the measurements that underpin the U.S. innovation ecosystem while prioritizing NIST's world-leading efforts focused on quantum science.

Quantum science is a top strategic priority for NIST. A recognized world leader in the field of quantum science and technology, NIST plays a central role in the National Quantum Initiative and is developing critical measurement capabilities necessary for the U.S. to win the race for quantum leadership. In FY 2021 NIST is investing $40.3 million, a level maintained from FY 2020, in a portfolio of foundational quantum research impacting quantum computing, communications, and cryptography. This research, combined with NIST's expertise in advanced materials, nanofabrication, and microelectronics; our network of joint institutes (JILA and JQI); and the newly created Quantum Economic Development Consortium, make NIST a true hub of quantum innovation. In FY 2021 NIST will focus a portion of its quantum research portfolio on the grand challenge of quantum networking, a key element in the long-term evolution of quantum technologies, as the full economic and security benefit of quantum will be dependent upon the ability to securely and efficiently transmit quantum information between multiple quantum devices and sensors.

Budget Request



FY 2019 Enacted: **$235.6 M**
Lab Programs: $172.4 M
Corp Serv: $57.6 M
SC-SP: $5.6 M

FY 2020 Enacted: **$246.9 M**
Lab Programs: $183.8 M
Corp Serv: $57.4 M
SC-SP: $5.6 M

FY 2021 Requested: **$213.6 M (-13.5%)**
Lab Programs: $173.7 M
Corp Serv: $36.0 M
SC-SP: $3.9 M

Note: The FY 2021 request includes $8.8 million to fund inflationary adjustments.

NIST physical scientist Thomas Brian Renegar and his colleagues used the sophisticated digital measurement techniques of modern forensics to create high-resolution 3D replicas of the bullets used to assassinate President John F. Kennedy. Here, Renegar examines the positioning of the bullet before the first of 22 scanning runs.

Credit: C. Suplee/NIST

Illustrative program changes:

- **-$42.1 million** to stop or reduce measurements and calibrations that support customers in sectors from communications and defense to manufacturing and transportation. NIST will reduce support for the operation of the Organization of Scientific Area Committees for Forensic Science and Hollings Marine Laboratory, as well as eliminate funding for the NIST Forensic Science Center of Excellence led by Iowa State University. NIST will reduce its presence and contributions in international legal metrology, eliminate support for the Urban Dome program, and reduce funding allocated to the Lab-to-Market program.

Fundamental Measurement, Quantum Science and Measurement Dissemination (cont.)

Program Highlights

NIST maintains and disseminates the authoritative values for the base units of the International System of Units (SI) in the United States, along with developing the methods and technology required to realize and/or measure each base unit to the highest possible accuracy. Typically, that endeavor results in major impacts in measurement science, as well as advanced metrology for industry, medicine, defense and homeland security, science, and government. NIST Measurement Services consist of calibration services, reference materials, reference instruments, and reference data that are continually improving and evolving to meet the nation's needs. For example:

- NIST scientists developed and applied unique measurement methods and novel computational algorithms toward a systematic expansion of the NIST Tandem Mass Spectral (MS) Library. This library, the highest-quality and most comprehensive MS data resource of its kind in the world, is relied upon for molecular species identification in complex mixtures. The molecules in the library, such as metabolites, drugs, pesticides, and a wide range of industrial compounds, are of prime importance for studies in human health, food, environment, and forensics. Thousands of units of the library are distributed by major MS manufacturers worldwide each year.
- NIST scientists demonstrated the first next-generation "time scale" — a system that incorporates data from multiple atomic clocks to produce a single highly accurate timekeeping signal for distribution — that outperforms current technologies. NIST also developed an optical quantum logic clock that relies on aluminum atoms. Demonstrating the world's lowest uncertainty, the clock will not gain nor lose one second in 33 billion years. Beyond providing accurate time to millions of customers, such as financial markets and computer and phone networks, these optical clocks have far-reaching implications for improving spacecraft navigation, discovering new physics, and expanding research areas in quantum information science.
- In 2019, NIST introduced a new streamlined experience for customers to order measurement services through the NIST website. Currently, NIST Calibrations Services are available for order; in the coming months, customers will also be able to order Standard Reference Data (SRD), Standard Reference Materials (SRM), and Standard Reference Instruments (SRI) through this new storefront. Since the new system went live in late spring 2019, more than 900 customers have established accounts and placed over 845 orders for special calibrations.
- The NIST on a Chip program continues to make significant strides in bringing quantum science breakthroughs from the lab to the market by creating prototypes for small, inexpensive, low-power, and easily manufactured sensors. One example is a chip-scale photonic thermometer that uses the optical properties of materials to measure changes in temperature, developed with an industry partner. The program's goal is to develop technologies that will enable precision measurements on factory floors, in hospitals, in commercial and military aircraft, in research labs, and ultimately in homes, automobiles, and personal electronic devices.
- NIST recently launched the Quantum Economic Development Consortium (QED-C) in partnership with SRI International. QED-C aims to expand U.S. leadership in global quantum R&D and the emerging quantum industry in computing, communications, and sensing. With funding from both the government and private-sector member organizations, the consortium fosters public-private sector coordination. NIST is supporting the QED-C through funding and extensive interactions

NIST physicist Katie McCormick adjusts a mirror to steer a laser beam used to cool a trapped beryllium ion (electrically charged atom). McCormick and her colleagues got the ion to display record-setting levels of quantum motion, an advance that can improve quantum measurements and quantum computing.

Credit: J. Burrus/NIST

between QED-C member companies and NIST technical staff on technologies including quantum sensors, atomic clocks, enabling technologies for quantum communications, and other areas.

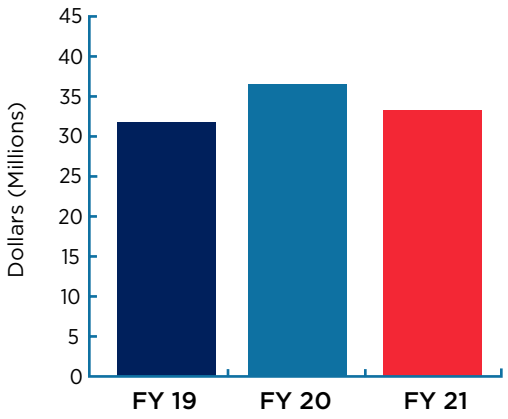
- For the first time ever, NIST scientists "teleported" a computer circuit instruction known as a quantum logic operation between two separated ions, showcasing how quantum computer programs could carry out tasks in future large-scale quantum networks. The expertise of NIST scientists and the unique capabilities of our facilities are leveraged closely with partners in academia through NIST's network of joint institutes — with JILA, at the University of Colorado Boulder, and JQI and QuICS, at the University of Maryland.
- NIST is rebuilding the Interagency Edison (iEdison) reporting system for extramural inventions. The rebuild will modernize and improve the key features of this system that is a strategic priority of the Trump Administration's Lab-to-Market Cross-Agency Priority Goal to support innovative tools and services for technology transfer.

Health and Biological Systems Measurements

NIST is paving the way for a vibrant U.S. bioeconomy by developing measurements that enable the reproducibility of biomedical research results to ensure the efficacy and safety of treatments and ultimately increase confidence in clinical decisions. NIST partners with industry and other government agencies to provide measurement science and standards that are essential for health and bioscience innovations. NIST's programs range from supporting underlying technologies and measurements for precision medicine and medical imaging to accelerating understanding in synthetic biology and genomics. New and improved measurement capabilities provide the basis for industries to harness this information for future medical technologies.

NIST requests funds to support innovation, safety, and confidence in the nation's bioscience and health care while prioritizing efforts that support the bioeconomy, one of the Industries of the Future.

Budget Request



FY 2019 Enacted: **$32.1 M**
Lab Programs: $31.3 M
Corp Serv: $0.0
SC-SP: $0.8 M

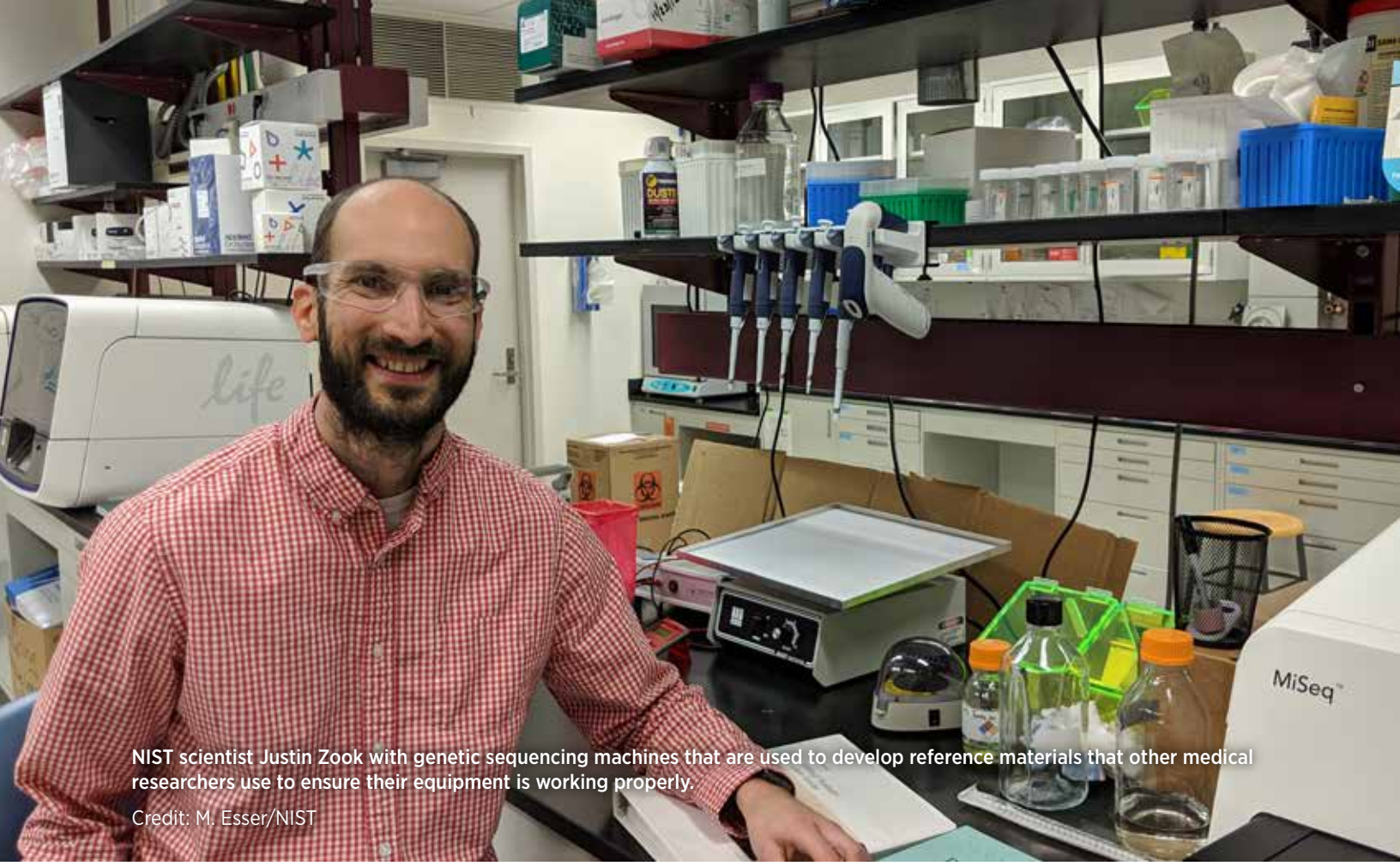
FY 2020 Enacted: **$36.6 M**
Lab Programs: $33.8 M
Corp Serv: $2.0 M
SC-SP: $0.8 M

FY 2021 Requested: **$34.5 M (-5.7%)**
Lab Programs: $31.8 M
Corp Serv: $2.1 M
SC-SP: $0.5 M

Note: The FY 2021 request includes $1.2 million to fund inflationary adjustments.

Illustrative program changes:

- **-$3.3 million** consolidate research efforts at the NIST campus in Gaithersburg, Maryland, ending support for the Joint Initiative for Metrology in Biology (JIMB), a partnership with SLAC and Stanford University to develop advanced measurement capabilities for the growing synthetic biology industry.



NIST scientist Justin Zook with genetic sequencing machines that are used to develop reference materials that other medical researchers use to ensure their equipment is working properly.

Credit: M. Esser/NIST

Program Highlights

Breakthrough technologies such as gene sequencing, gene editing, and advanced imaging have laid the foundation for significant growth opportunities in fields beyond medicine and health, such as chemical manufacturing, energy, and agriculture. NIST is focusing its bioscience efforts to build the measurement science capabilities that will support the growing U.S. bioeconomy. For example:

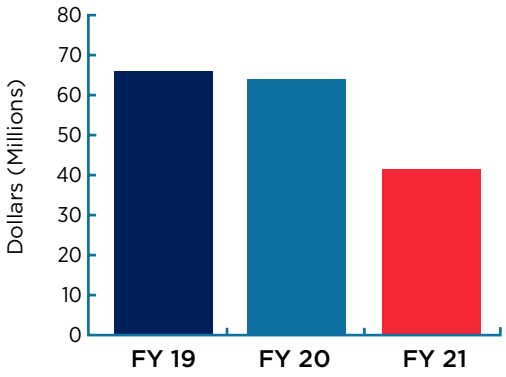
- NIST administers the U.S. Mirror Committee of the International Organization for Standardization (ISO) Technical Committee on Biotechnology, creating an infrastructure for American influence and participation in global biotechnology standards development and ensuring our place in international markets.
- NIST is developing expertise in high-throughput cell culture and measurements of engineered microbes to establish capabilities that will enable routine, safe, and reliable engineering of cells for the development of effective living therapeutics, environmental sensing, and structured materials fabrication through the automated NIST Living Measurement Systems Foundry.
- NIST is developing the building blocks for bioscience through partnerships such as the NIST Genome Editing Consortium, a collaborative effort to understand and address the measurement and standards needs of industry, academia, government, and others interested in using genome editing to develop products such as medical therapies. The consortium recently released a lexicon to serve as a unified set of terms and definitions for the community. NIST researchers are working to address the measurement challenges identified by the consortium.
- NIST is assisting the growing regenerative medicine industry to meet its measurement assurance and regulatory challenges. NIST will continue to work with companies and other federal agencies to develop measurement assurance strategies for the quantitative measurement of living systems needed for translation and commercialization of advanced therapies.

Physical Infrastructure and Resilience

NIST's Physical Infrastructure and Resilience activities support the safety, interoperability, and resilience of the nation's infrastructure at the component, structure, and system levels. NIST's research supports the development of building codes that make the built environment healthier for occupants, more resilient against hazards, and safer for both residents and first responders. In collaboration with policy makers, building officials, and planning groups, NIST produces guides to help communities integrate resilience into their economic development, zoning, mitigation, and other local planning activities that impact buildings, public utilities, and infrastructure systems.

NIST requests funds to develop measurement methods, reference materials, and data that support innovation in the performance and resilience of the built environment.

Budget Request



Note: The FY 2019 request includes $2.5 million to fund inflationary adjustments.

FY 2019 Enacted: **$64.1 M**
Lab Programs: $57.8 M
Corp Serv: $4.8 M
SC-SP: $1.5 M

FY 2020 Enacted: **$63.1 M**
Lab Programs: $56.8 M
Corp Serv: $4.8 M
SC-SP: $1.5 M

FY 2021 Requested: **$43.7 M (-30.7%)**
Lab Programs: $42.5 M
Corp Serv: $0.1 M
SC-SP: $1.1 M

Illustrative program changes:

- **-$21.9 million** eliminating work on advances in science and technology to markedly improve building energy efficiency and occupant safety in the United States. NIST will eliminate funding for the Disaster Resilience Research Grants Program, the Fire Research Grants Program, and the Community Resilience Center of Excellence led by Colorado State University.

Program Highlights

NIST's fundamental research, measurement protocols, and standards support help architects, engineers, urban planners, local governments, and first responders create and maintain safer, healthier, and more resilient built environments. For example:

- NIST's fire research program is developing advances in predictive computational tools, advanced fire detection technologies, and fire-resistant materials. Researchers at NIST's National Fire Research Laboratory developed a camera system to capture 360-degree video that provides researchers the ability to safely observe and measure extremely harsh fire environments.

In 2018, NIST dispatched teams across the country to evaluate infrastructure failures as a result of natural disasters, including hurricanes and wildfires. NIST recently launched a multi-year effort to study how critical buildings and emergency communications systems performed in Puerto Rico during Hurricane Maria.

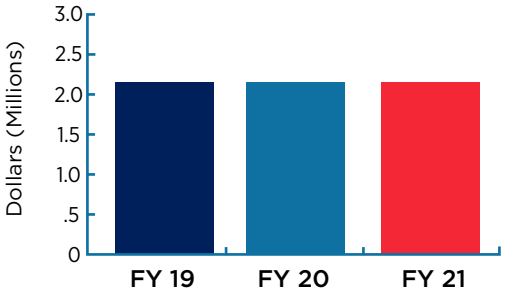
Credit: Kris Grogan/FEMA

- NIST continues to disseminate resources to assess resilience and to support informed planning and decision-making, including the "NIST Community Resilience Planning Guide for Buildings and Infrastructure Systems" and other tools. In 2019, NIST worked closely with emergency management and community development staff in Nashua, New Hampshire, to inform their resilience initiative.
- NIST carries out research for improved model building codes, voluntary standards, and best practices to reduce losses from disaster. As part of its responsibilities outlined in the National Construction Safety Team Act, NIST is conducting a multi-year study to understand how critical buildings and emergency communications systems performed during Hurricane Maria. NIST also has leadership roles in the National Earthquake Hazards Reduction Program and National Windstorm Impact Reduction Program.
- Researchers are exploring energy-efficient methods for ensuring indoor air quality through experiments in the Net-Zero Energy Residential Test Facility located on the NIST Gaithersburg campus, as part of a program focused on enabling advances in high performance buildings and operations that lower costs while ensuring the safety and security of occupants.

Baldrige Performance Excellence Program

The Baldrige Performance Excellence Program oversees the nation's only Presidential award for performance excellence while offering criteria, assessments, tools, training, and a community for those dedicated to helping organizations improve. The program directly reaches thousands of organizations every year through their use of the Baldrige framework, participation in the award process, and attendance at conferences and training programs. The program impacts hundreds of thousands of workers and millions of customers, patients, students, and residents, and recently introduced the Baldrige Cybersecurity Excellence Builder and the Communities of Excellence framework to promote adoption of best practices in cybersecurity and across entire communities.

Budget Request



FY 2019 Enacted: **$2.2 M**
FY 2020 Enacted: $**2.2 M**
FY 2021 Requested: **$2.2 M (0%)**

No major program changes.

The Mary Greeley Medical Center (pictured above) in Ames, Iowa, was one of six organizations to receive the 2019 Malcolm Baldrige National Quality Award.

Credit: Mary Greeley Medical Center

Program Highlights

- In 2019, the Baldrige Program honored six organizations with the Malcolm Baldrige National Quality Award in recognition of their unceasing drive for innovative solutions to complex challenges, visionary leadership, and operational excellence. The winners included two health care organizations, a community college, and three non-profit entities — including one city.
- The program is implementing a new presidential award for excellence in workforce training and development to recognize organizations that are preparing our workforce for the jobs of today and tomorrow, as called for in Executive Orders 13845 and 13801.

Technology Transfer

NIST broadly defines technology transfer as the overall process by which its knowledge, facilities, or capabilities in measurement science, standards, and technology promote U.S. innovation and industrial competitiveness to enhance economic security and improve quality of life.

For America to maintain its position as the global leader in innovation, bring products to market more quickly, grow the economy, and maintain a strong national security innovation base, it is essential that we optimize technology transfer and support programs that increase the return on investment (ROI) from federally funded R&D. NIST has a unique role in promoting and reporting on the overall strength of federal efforts in technology transfer, including the Lab-to-Market initiative to increase the economic impact of federally funded R&D by accelerating the transfer of new technologies from the laboratory to the commercial marketplace. NIST performs a critical role in coordinating federal government activities, including convening the Interagency Working Group for Technology Transfer and serving as the "host agency" for the Federal Laboratory Consortium.

NIST uses many different approaches to work collaboratively with industry and other organizations. Primary activities include participation on committees in standards developing organizations; Cooperative Research and Development Agreements (CRADAs) and Material Transfer Agreements (MTAs); access to user facilities; a postdoctoral research program; guest researchers; and conferences, seminars, and workshops. NIST offers direct work products that can be used by others, including licensing patented inventions, laboratory accreditation services, Standard Reference Data (SRD), and Standard Reference Materials (SRM).

NIST TECHNOLOGY TRANSFER ACTIVITIES AND PRODUCTS (FY 2019)

Invention Disclosure and Patenting	**54** invention disclosures **63** patent applications filed **32** patents issued
License Agreements	**15** new **68** active
Calibration Services	**11,519**
Active Traditional Cooperative Research and Development Agreements (CRADAs)	**434**
Material Transfer Agreements (MTAs)	**276**
National Voluntary Laboratory Accreditation Program (NVLAP)	**674** NVLAP-accredited laboratories
User Facilities Center for Nanoscale Science and Technology distinct users NIST Center for Neutron Research (NCNR) research participants	 **314** **2,923**
Participation in Standards Developing Organizations	**440** staff members in 112 organizations
Scientific and Technical Publications	**1,396**
Standard Reference Data (SRD)	**2,613** e-commerce orders **9,880** sold via distributor **2,835** product downloads
Standard Reference Materials (SRM)	**29,955** units sold
NIST Postdoctoral Researchers	**165**
NIST Guest Researchers	**3,180**

Tipton Mills, a client of the Purdue Manufacturing Extension Partnership (the MEP Center in Indiana and part of the MEP National Network), is dedicated to the production of safe and delicious food and drink for national and private brands.

Credit: Mark Simons

Industrial Technology Services

NIST's extramural programs, which include Manufacturing USA and the Hollings Manufacturing Extension Partnership (MEP), help U.S. industry develop and implement new technology, develop robust supply chains, and refine their systems for efficiency and effectiveness, all while making them more competitive in the global economy.

Manufacturing USA is a network of manufacturing innovation institutes where companies, universities, community colleges, and entrepreneurs develop new manufacturing technologies with broad applications. The primary goal of the network is to ensure that American innovations and inventions currently going offshore for production in competitor nations are scaled up from lab experiments to products and processes that can be used by U.S. manufacturers.

The MEP program is a federal-state-industry partnership that consists of centers located across the country working directly with their local manufacturing communities to strengthen the competitiveness of our nation's domestic manufacturing base. NIST MEP provides technical assistance in adopting advanced manufacturing technologies, addressing emerging manufacturing needs, and understanding foreign manufacturing and compliance issues. They provide guidance on cybersecurity of supply chains and transferring technology from NIST labs and other federal research organizations.

"Today, we celebrate the renaissance in American manufacturing that is restoring our country's dominance in the global and domestic markets, and we recommit to building on these achievements in the years to come."

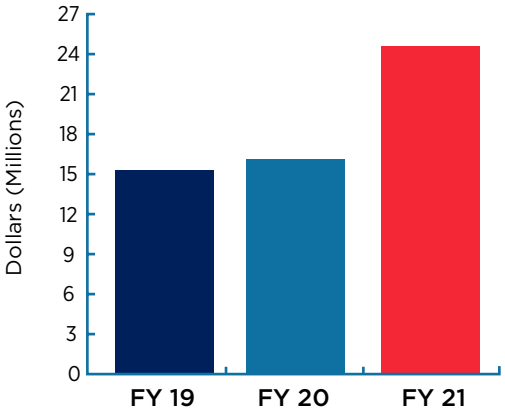
– Presidential Proclamation on National Manufacturing Day, 2019

Manufacturing USA

Manufacturing USA is a national network of manufacturing innovation institutes that bring together nearly 2,000 industry, government, and academic institutions to restore U.S. leadership in advanced manufacturing by accelerating the development of game-changing technologies through access to state-of-the-art facilities and workforce training. NIST coordinates the nationwide network of institutes and funds the National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL).

NIST requests funds to coordinate the institute network and open a competition to select a new Manufacturing USA institute.

Budget Request



FY 2019 Enacted: **$15.0 M**

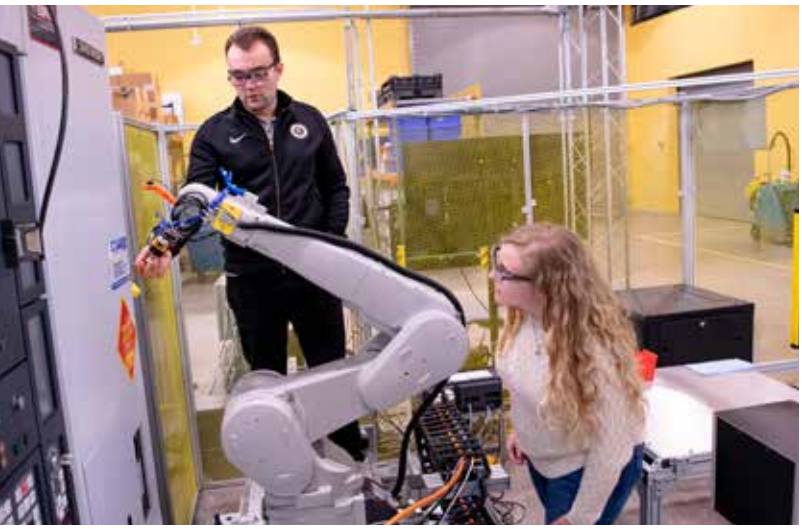
FY 2020 Enacted: $**16.0 M**

FY 2021 Requested: **$25.3 M (+58.1%)**

Illustrative program changes:

- **+$9.1 million** for a total of $20.0 million dedicated to compete and fund one new institute in FY 2021 while discontinuing federal funding for NIIMBL, NIST's first manufacturing innovation institute.

Note: The FY 2021 request includes $0.2 million to fund inflationary adjustments.



An MxD engineer gives tour participants an in-depth view into the Discrete Manufacturing Testbed featured on the MxD Factory Floor located in its Innovation Center in Chicago, IL.

Credit: MxD

Program Highlights

- Manufacturing USA institutes collectively represent two-thirds of Fortune 50 U.S. manufacturers, more than 850 small manufacturers, eight of the 10 top-ranked research and engineering universities, and hundreds of community colleges and technical training schools.
- The Manufacturing USA network has reached more than 200,000 workers, students, and educators through education and training efforts, including programs focused on training veterans.
- The 14 institutes have received $1 billion in federal funds and over $2 billion in nonfederal commitments, demonstrating the remarkable catalyzing effect of matching funds. State governments contributed more than $400 million — underscoring the importance of advanced manufacturing to the future success of state and local economies.

Hollings Manufacturing Extension Partnership

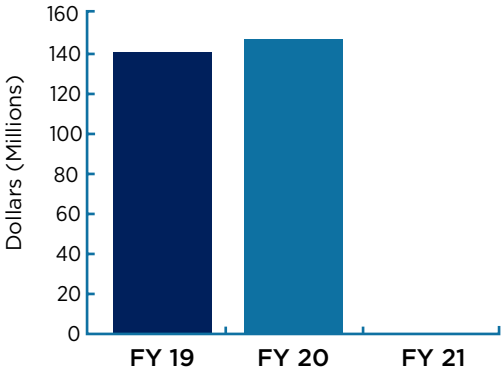
Established pursuant to the Omnibus Trade and Competitiveness Act of 1988, MEP comprises a network of grant-supported centers in all 50 states and Puerto Rico that provide technical and business assistance to small manufacturers. Since its creation, the network has worked with 111,000 manufacturers, leading to $132 billion in new sales and $22 billion in cost savings, and it has helped create and retain over 1.2 million jobs. In a given year MEP centers provide in-depth technical assistance to 8,900 client firms, including nearly 1,600 rural and more than 3,100 very small manufacturers.

The FY 2021 budget eliminates federal funding for NIST MEP.

The Renewal Workshop, a client of OMEP (the MEP Center in Oregon and part of the MEP National Network), is a leading provider of circular solutions for apparel and textile brands.

Credit: MEP National Network

Budget Request



FY 2019 Enacted: **$140.0 M**
FY 2020 Enacted: **$146.0 M**
FY 2021 Requested: **$0 (-100%)**

Illustrative program changes:

- **-$146 million** eliminating funding for the MEP program. In order for MEP centers to continue providing services they would need to find sufficient nonfederal funding sources such as increased user fees and/or state or local support.

In 2019, NIST opened up a new wing of its Radiation Physics Building. The walls and window of this big metal-encased hot cell are heavily shielded, protecting the operator from the highly radioactive materials placed inside the hot cell. Robotic arms provide distance, so the operator doesn't need to actually touch the radioactive material inside.

Credit: J. Stoughton/NIST

Construction of Research Facilities

The NIST Construction of Research Facilities (CRF) appropriation funds NIST construction activities, including the maintenance, repair, improvements, and major renovation of facilities occupied or used by NIST in Gaithersburg, Maryland; Boulder and Fort Collins, Colorado; and Kauai, Hawaii, to meet current and future measurement and research needs for the nation.

Scientific work at NIST laboratories supports the Industries of the Future and other national priorities such as health care, physical infrastructure, information technology, and many other areas. Facilities that can maintain environmental conditions such as temperature, relative humidity, and air quality are essential to the ability of NIST's Laboratory Programs to make advances in wide-ranging areas including the Industries of the Future — quantum science, AI, 5G, advanced manufacturing, and the bioeconomy — as well as other core laboratory activities.

NIST measurement capabilities must be maintained at the highest levels of precision and accuracy to meet the increasing requirements of its stakeholders. Facilities that can maintain ideal environmental conditions would eliminate lost productivity and increase efficiency and effectiveness, providing researchers the opportunity to maximize their efforts on mission-related activities. In addition to being environmentally sound, all facilities must be compliant with various health and safety regulations. Other major conditions that must be addressed are the needs to increase the capacity of NIST facilities, to improve access for people with disabilities, and to safeguard the utility infrastructure of existing buildings.

NIST's ability to maintain and renovate its infrastructure has been falling further and further behind. Numerous major utility infrastructure systems are currently in critical condition, creating risks of catastrophic failure of entire laboratory buildings. Major electrical and mechanical equipment at both campuses are beyond their useful life — they are no longer supported by the manufacturers, replacement parts are nonexistent, and the equipment is failing at an accelerated rate. The types of high-precision research and measurement the future requires will not be possible without wholesale facility upgrades.

"Unleashing American discovery and innovation means providing the environment that allows our scientists, engineers, inventors, and entrepreneurs to do what they do best — explore, discover and be creative."

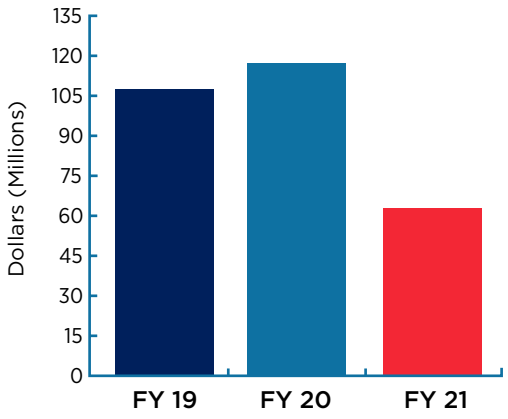
– Kelvin K. Droegemeier, Director of the White House Office of Science and Technology Policy

Construction of Research Facilities

The funds requested in FY 2021 support Safety, Capacity, Maintenance and Major Repairs (SCMMR) and Construction and Major Renovations. The SCMMR request of $40.6 million will primarily fund annual fixed costs for salaries, recurring contracts, capital asset management, and planning/support costs.

With Construction and Major Renovation base funding, annual payments of $19.6 million will go to GSA's Federal Capital Revolving Fund (FCRF) to fund the full renovation of NIST's Building 1 in Boulder, Colorado. With SCMMR base funding, NIST will prioritize its efforts to maintain and repair its facilities and address small emergency SCMMR projects. If major facilities-related emergency situations arise, previously planned facilities work will be reprioritized as appropriate.

Budget Request



Note: The FY 2021 request includes $2.2 million to fund inflationary adjustments.

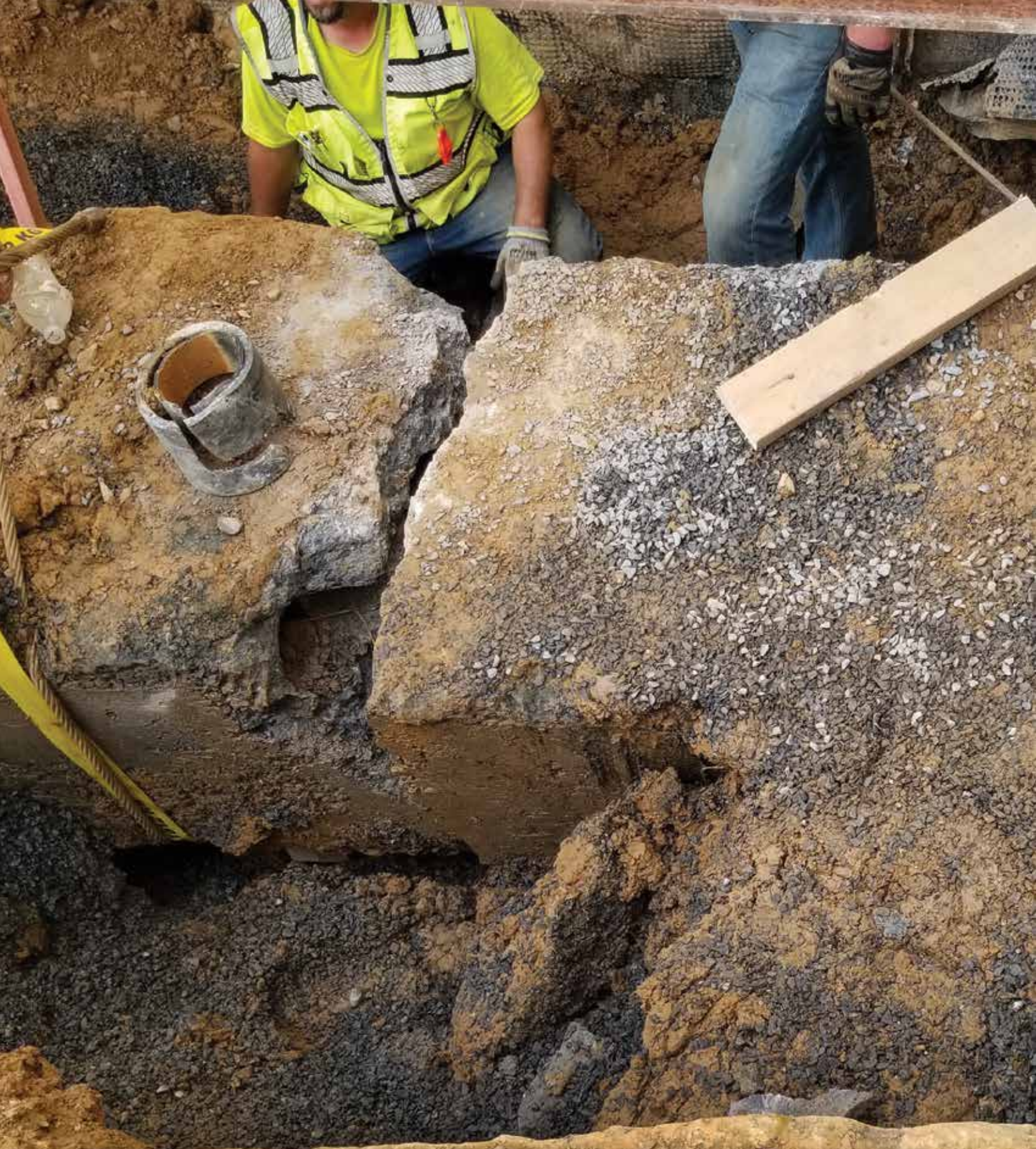
FY 2019 Enacted: **$106.0 M**
FY 2020 Enacted: $**118.0 M**
FY 2021 Requested: **$60.2 M (-49.0%)**

Illustrative program changes:

- **-$36.5 million** resulting in deferment of SCMMR projects, including critical site and facility infrastructure projects necessary for routine facility operations.
- **+$19.6 million** to provide for the repayment of the GSA Federal Capital Revolving Fund to fund the renovation of NIST's Building 1 in Boulder, Colorado, estimated at $294 million including furniture, fixtures, and equipment.
- **-$43.0 million** to reflect the one-time construction drop out for the Building 1 renovation project.

Program Highlights

- The contractor selected to develop a 20-year implementation plan for the Gaithersburg and Boulder master plans conducted a lengthy analysis and will develop a combined implementation plan for both campuses including timing and phasing of projects along with budget estimates.
- In September 2019, NIST held a ribbon-cutting ceremony for the newly dedicated H Wing of Building 245 in Gaithersburg. Known as the Radiation Physics Building, the facility is devoted to radiation measurements critical for food safety, national security, environmental science, and more. The completion of the H Wing, housing 38 laboratories in three stories and nearly 7,900 square meters, is a major milestone in the Building 245 renovation project.



While excavating for the renovation of the Radiation Physics Building, construction crews found that the electrical duct bank that carries all of the power feeder cables to the facility had, over time, collapsed and broken. The photo shows emergency response crews working to stabilize the broken concrete duct bank. This was one of 3 similar failures on campus, necessitating a project to replace all electrical duct banks

Credit: NIST

AT A GLANCE

2019 Enacted	2020 Enacted	2021 Request
986 M	1,034 M	738 M

BUDGET TABLES

Table 1. Construction of Research Facilities ($, thousands)

Activity	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Construction of Research Facilities	$ 106,000	$ 118,000	$ 60,244

Table 2. Industrial Technology Services ($, thousands)

Activity	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Hollings Manufacturing Extension Partnership	$ 140,000	$ 146,000	$ 0
Manufacturing USA	$ 15,000	$ 16,000	$ 25,252
ITS Total	$ 155,000	$ 162,000	$ 25,252

Table 3. Scientific and Technical Research and Services ($, thousands)

Activity	FY 2019 Enacted	FY 2020 Enacted	FY 2021 Request
Advanced Communications, Networks and Scientific Data Systems	**$ 59,952**	**$ 67,452**	**$ 60,556**
Laboratory Programs	$ 55,587	$ 66,087	$ 59,614
Corporate Services	$ 1,365	$ 1,365	$ 943
Standards Coordination and Specialty Programs	$ 0	$ 0	$ 0
Advanced Manufacturing and Material Measurements	**$ 126,985**	**$ 131,235**	**$ 92,500**
Laboratory Programs	$ 111,393	$ 115,643	$ 82,294
Corporate Services	$ 3,043	$ 3,043	$ 2,103
Standards Coordination and Specialty Programs	$ 12,549	$ 12,549	$ 8,104
Cybersecurity and Privacy	**$ 77,469**	**$ 77,469**	**$ 79,427**
Laboratory Programs	$ 75,612	$ 75,612	$ 78,145
Corporate Services	$ 1,857	$ 1,857	$ 1,283
Standards Coordination and Specialty Programs	$ 0	$ 0	$ 0
Fundamental Measurement, Quantum Science and Measurement Dissemination	**$ 235,624**	**$ 246,874**	**$ 213,610**
Laboratory Programs	$ 172,437	$ 183,823	$ 173,725
Corporate Services	$ 5,636	$ 5,647	$ 3,901
Standards Coordination and Specialty Programs	$ 57,551	$ 57,404	$ 35,983
Health and Biological Systems Measurements	**$ 32,069**	**$ 36,569**	**$ 34,476**
Laboratory Programs	$ 31,300	$ 33,800	$ 31,849
Corporate Services	$ 769	$ 769	$ 531
Standards Coordination and Specialty Programs	$ 0	$ 2,000	$ 2,097
Physical Infrastructure and Resilience	**$ 64,136**	**$ 63,136**	**$ 43,702**
Laboratory Programs	$ 57,806	$ 56,806	$ 42,492
Corporate Services	$ 1,537	$ 1,537	$ 1,062
Standards Coordination and Specialty Programs	$ 4,792	$ 4,792	$ 148
Exploratory Measurement Science	**$ 75,409**	**$ 75,409**	**$ 75,543**
Laboratory Programs	$ 71,625	$ 71,625	$ 74,090
Corporate Services	$ 1,807	$ 1,807	$ 1,249
Standards Coordination and Specialty Programs	$ 1,977	$ 1,977	$ 204
NIST User Facilities	**$ 53,657**	**$ 53,657**	**$ 50,013**
Laboratory Programs	$ 52,371	$ 52,371	$ 49,125
Corporate Services	$ 1,286	$ 1,286	$ 8,848
Standards Coordination and Specialty Programs	$ 0	$ 0	$ 0
Baldrige Performance Excellence Program	**$ 2,000**	**$ 2,000**	**$ 2,000**
STRS Total	**$ 724,500**	**$ 754,000**	**$ 652,027**

Note: Totals may not add due to rounding.

COVER IMAGE: NIST electrical engineer Shelly Bagchi evaluates the ease-of use and effectiveness of an experimental user interface for a robot arm. Bagchi and her colleagues are developing test methods, metrics and AI tools to assess the ability of robot systems to work collaboratively with humans.

Credit: ©David Hills

National Institute of Standards and Technology
U.S. Department of Commerce

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