NATIONAL INSTITUTE
OF STANDARDS AND TECHNOLOGY

NATIONAL TECHNICAL INFORMATION SERVICE

FISCAL YEAR 2022
BUDGET SUBMISSION TO CONGRESS

DEPARTMENT OF COMMERCE
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
Budget Estimates, Fiscal Year 2022
Congressional Submission

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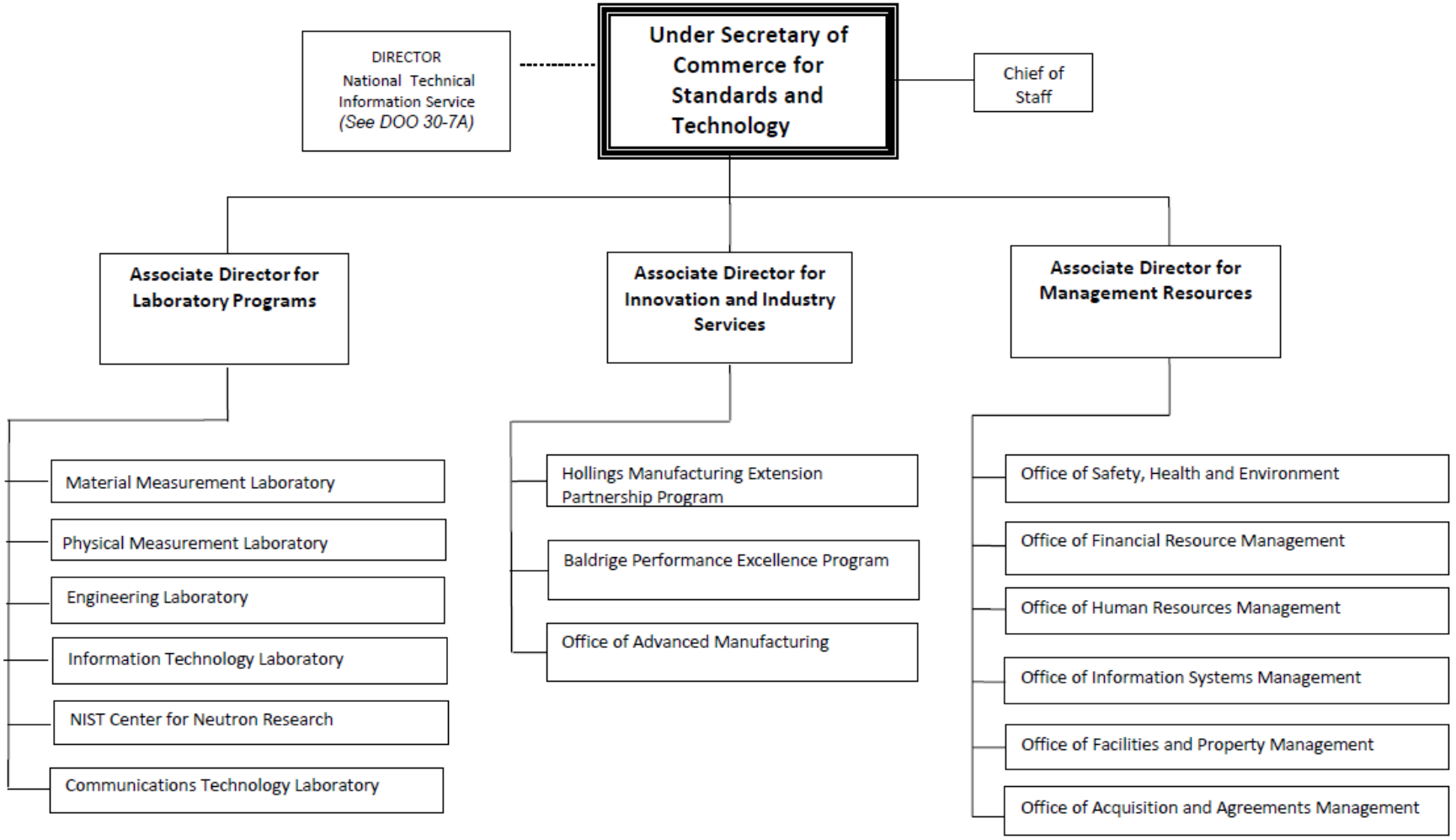
Exhibit 2

U.S. DEPARTMENT OF COMMERCE
National Institute of Standards and Technology



Department of Commerce
National Institute of Standards and Technology
Budget Estimates, Fiscal Year 2022
Executive Summary

The National Institute of Standards and Technology (NIST) mission is: To promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology enhancing economic security and improving our quality of life. NIST is authorized by the NIST Organic Act (15 USC 271), which outlines major roles for NIST in promoting national competitiveness and innovation.

The FY 2022 budget request is $1,497.2 million, an increase $462.7 million from the FY 2021 Enacted level. The FY 2022 discretionary budget request for NIST accomplishes its mission and addresses its priorities through the following three appropriation accounts:

1. Scientific and Technical Research and Services (STRS): The FY 2022 budget request is $915.6 million, which includes $96.14 million in program increases above the FY 2021 Enacted level and $31.43 million in inflationary adjustments.

Program Increases	Funding ($ in thousands)
Advanced Communications Research and Standards	$12,000
Climate and Energy Measurements, Tools and Testbeds	$20,000
Measurements for the Circular Economy	$5,000
Partnerships, Research, and Standards to Advance Trustworthy Artificial Intelligence	$15,000
Quantum Information Science, Engineering, and Metrology	$15,000
Next-Generation Semiconductor Research and Standards	$10,000
Strengthening Equity and Diversity in the Standards Workforce	$5,143
Supporting the American Bioeconomy	$14,000
Total	**$96,143**

2. Industrial Technology Services (ITS): The FY 2022 budget request is $441.6 million for ITS appropriation, an increase of $275.1 million above the FY 2021 Enacted level. Within the total ITS request, the Manufacturing USA (Mfg. USA) program is funded at $166.7 million and includes an increase of $150.1 million above the FY 2021 Enacted level; the Hollings Manufacturing Extension Partnerships (MEP) program is funded at $275.0 million, including a $125.0 million increase above the FY 2021 Enacted level.

3. Construction of Research Facilities (CRF): The FY 2022 budget request for CRF is $140.0 million, an increase of $60.0 million or 75 percent above the FY 2021 Enacted level for the repair and revitalization of NIST facilities to address the maintenance backlog.

Appropriation	(Dollar amounts in millions) FY 2021 Enacted *		FY 2022 Request		Change from FY 2021 Enacted Level	
	Positions	Amount	Positions	Amount	Positions	Amount
Scientific and Technical Research and Services	2,637	$788.0	2,801	$915.6	164	$127.6
Industrial Technology Services	99	166.5	162	441.6	63	275.1
Construction of Research Facilities	116	80.0	116	140.0	0	60.0
Working Capital Fund	674	0	684	0	10	0
TOTAL DISCRETIONARY RESOURCES	**3,526**	**1,034.5**	**3,763**	**1,497.2**	**237**	**462.7**

*Note: For comparison reasons, the supplemental mandatory FY 2021 American Rescue Plan is not included in this table.

Performance:
For current GPRA targets please see the FY 2022/2020 Annual Performance Plan and Report.

Adjustments:
Inflationary Adjustments

Inflationary adjustments totaling $34.480 million are included in the base.

Technical Adjustments (Transfers)

The Department of Commerce (DOC) is proposing to transfer two projects and funding out of the Working Capital Fund and the Advances and Reimbursable account to the Departmental Management Salaries and Expense account as part of its annual review to properly align and account programs and costs. This transfer executes the NIST portion of the DOC transfer. For more information regarding the specific projects and funding transfers for the DOC please refer to Exhibit 3 of the Departmental Management FY 2022 Congressional submission. The transfer amount for NIST is $154 thousand.

Proposed Reorganization of units within the Associate Director Laboratory Programs (ADLP):
The ADLP proposes a re-organizational change that transfers organizational units that currently reside with the Engineering Laboratory, the Information Technology Laboratory, and the Physical Measurement Laboratory to reside within the Communications Technology Laboratory. Details of the proposed changes are provided in Exhibit 3B that follows.

Department of Commerce
National Institute of Standards and Technology
Associate Director Laboratory Programs Reorganization

The proposed re-organizational change will enable NIST to play an even greater role supporting the evolution of the connected world that the U.S. public relies on in their daily lives both at work and at home. This re-organizational change transfers organizational units that currently reside with the Engineering Laboratory (EL), the Information Technology Laboratory (ITL), and the Physical Measurement Laboratory (PML) to reside within the Communications Technology Laboratory (CTL). Currently, NIST CTL promotes the development and deployment of advanced wireless communications technologies through dissemination of high-quality measurements, data, and research supporting U.S. innovation, industrial competitiveness, and public safety. With the reorganization, NIST CTL will be able to support research and standards needs for both wired and wireless communications technologies, providing a full end-to-end support for the National communications infrastructure that is needed to achieve the full benefits of a connected economy, one that relies on the deployment of “smart” devices for critical applications such as advanced manufacturing, logistics, transportation, space exploration, national security, and public safety.

The proposed re-organizational change is a testament to the commitment that NIST is making to ensure a sound foundation for national communications infrastructure and the importance of leading on the science and standards of tomorrow’s communications technology and applications, for the public, industry, and first responders. The re-organization brings elements of NIST EL, NIST ITL, and NIST PML into direct alignment with NIST CTL to address the measurement and standards challenges related to wireless and network-based communications as well as applications and technologies enabled by their deployment. The new CTL brings together experts to support DOC Strategic Objective 1.1 to advance innovation in applications of artificial intelligence to communications; strengthen competitiveness of America’s manufacturing base through technology development and deployment; lead the development of measurements and standards to facilitate digital commerce, wireless technologies, and autonomous vehicles; and promote effective sharing of spectrum for multiple uses, both communications and remote sensing. Additionally, this re-organization represents NIST’s commitment to support the “Secure 5G and Beyond Act of 2020” and numerous Presidential Memoranda on wireless spectrum and advanced communications since 2011.

Specific outcomes this re-organization include:
The re-organization aligns a significant portion of NIST’s Internet of Things relevant work under one organization which will allow for the creation of a significant mass of resources and will allow NIST to target its efforts for maximum impact. Specifically, this re-organization will bring together experts in network measurement science, systems control theory, industrial automation, smart manufacturing, smart grid, autonomous transportation to improve quality, security, reliability, interoperability, and efficiency of smart connected systems by the creation of the Smart Connected Systems Division.

The re-organization addresses NIST priorities in 5G and future networks by bringing together subject matter experts on network research for both wired and wireless systems under the new Wireless Networks Division that can advance the research, standardization and adoption of new technologies to increase the resilience, security, and privacy of networked systems, including 5G. Together these experts will conduct theoretical and experimental research in communication networks, protocols, digital communication systems, and components. They will leverage shared experimental test beds and build proof of concept prototypes to evaluate new technologies and refine standard specifications for wireless networks and Internet systems. These groups will continue to work closely with colleagues in NIST ITL to ensure a consistent NIST approach to cybersecurity and privacy.

The re-organization addresses NIST priorities in quantum communication and measurement science to support quantum computing by aligning the Superconductive Electronics Group with the RF Technology Division. This alignment unites staff from CTL Quantum Networks Innovation in Measurement Science Program and the CTL High Speed Measurements Group with PML staff with expertise in precision measurement techniques and develop fundamental standards such as for dc and ac voltage, impedance, signal synthesis, RF reference sources for wireless communications, and both quantum and energy-efficient advanced computing. These capabilities bring together fundamental metrology research for precision signal metrology under one organizational unit.

The re-organization creates a new division, the CTL Spectrum Technology and Research Division, to unite programs in the development and deployment of innovative measurement methods and tools to promote novel and efficient use of spectrum through improved access, sharing, atmospheric sensing, and precision timing. This reorganization creates the CTL Applied Systems Metrology Group as a standalone organizational unit that can serves as a partner to other federal agencies who are members of the National Advanced Spectrum and Communications Test Network (NASCTN). NASCTN is a multi-agency-chartered partnership hosted by NIST; other NASCTN members include NOAA, NTIA, DOD, NASA, and NSF. The CTL Applied Systems Metrology Group undertakes research to characterize, analyze, and evaluate systems in a congested and dynamic spectrum environment. The move of the CTL Shared Spectrum Metrology Group from the RF Technology Division to the CTL Spectrum Technology and Research Division unites efforts in spectrum sharing testbeds and measurement services to support spectrum sharing within the same organizational unit. Finally, the move of the PML Fiber Sources and Applications Group into this division unit brings together subject matter experts in remote and atmospheric sensing as well as optical wireless communications.

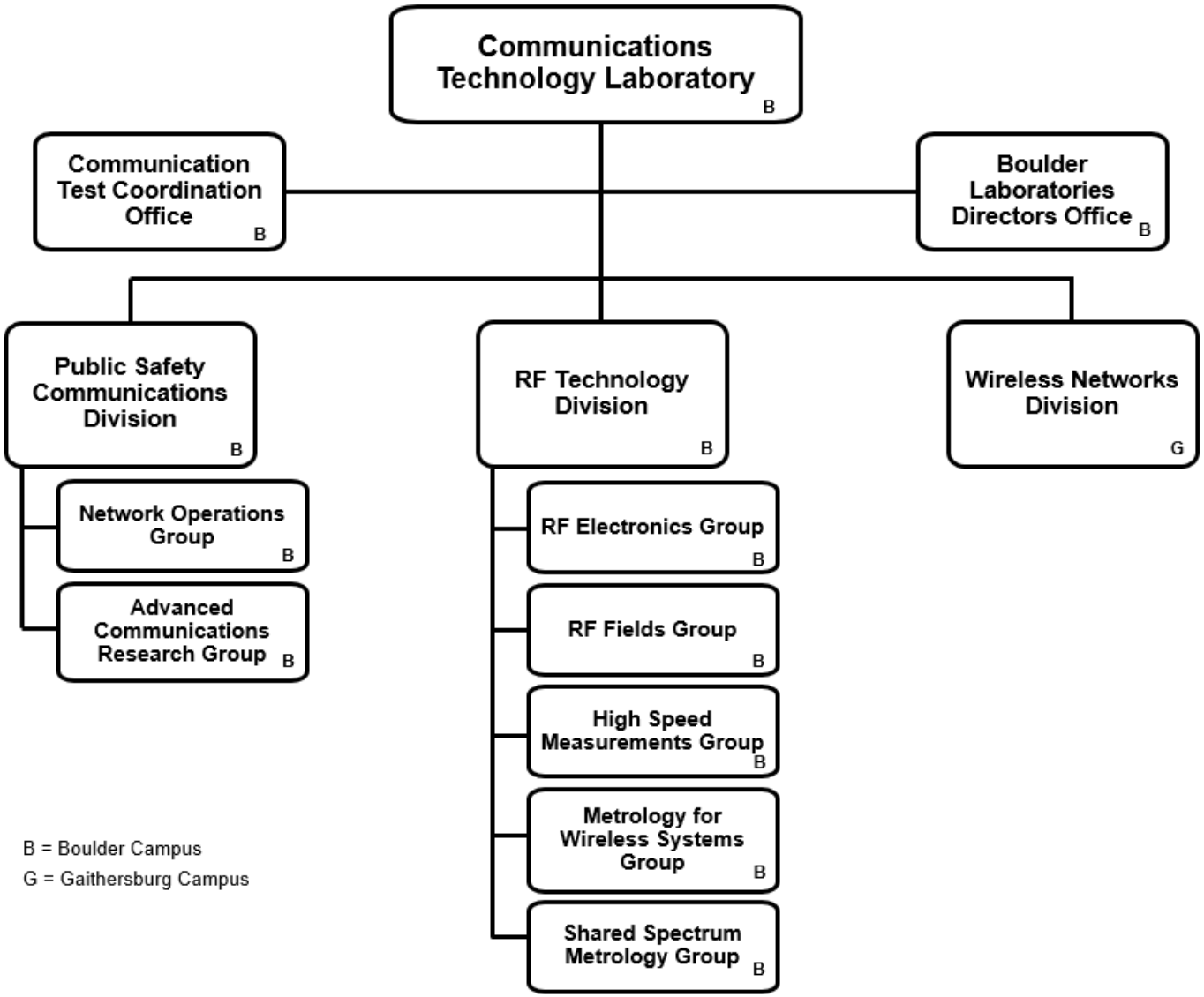
Staffing Impact: No additional staffing is required. All moves within the current CTL are realignments (no changes to the position description). All moves involving units currently outside of CTL will be reassignments (changes made to the position description). Any decisions to perform reassignments to current CTL employees (changes made to the position description) will be made after an initial assessment of project direction into the first year of the reorganization. The list also includes the relevant supervisors and their employees along with NIST Associates and their sponsors. No staff positions are being eliminated.

Budget Impact: No funding being transferred between accounts and new resources are not required. The proposed reorganization has no net budgetary impact on NIST. All relevant funding resources will be realigned accordingly within the ADLP and solvency will be maintained. The proposed changes will neither increase nor decrease costs.

Facilities Impact: The proposed reorganization has no impact on facilities. All staff and research programs will remain in their currently assigned space. The proposed changes will neither increase nor decrease ADLP’s current space requirements.

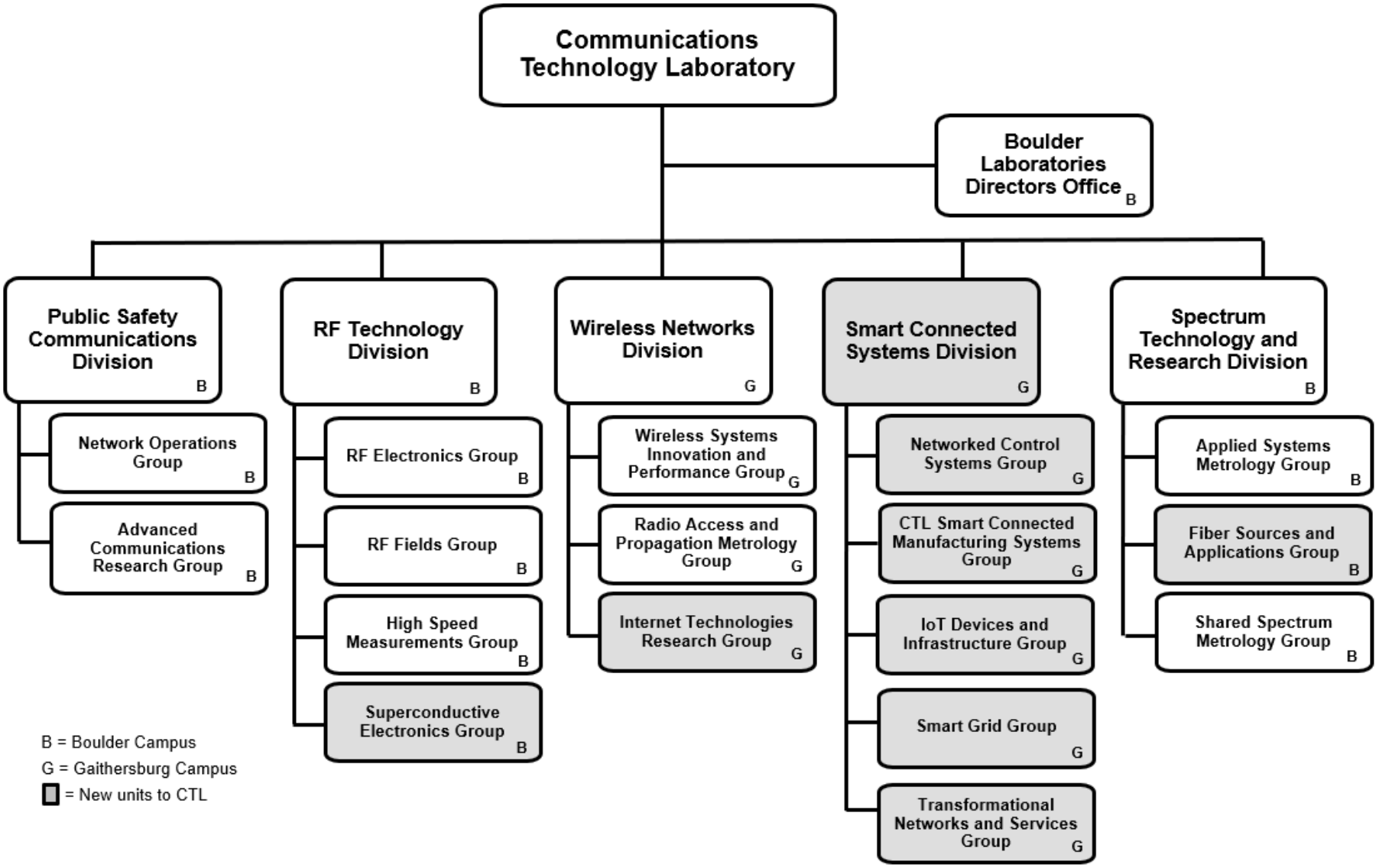
Communications Technology Laboratory

As Is:



Communications Technology Laboratory

To Be:



Engineering Laboratory

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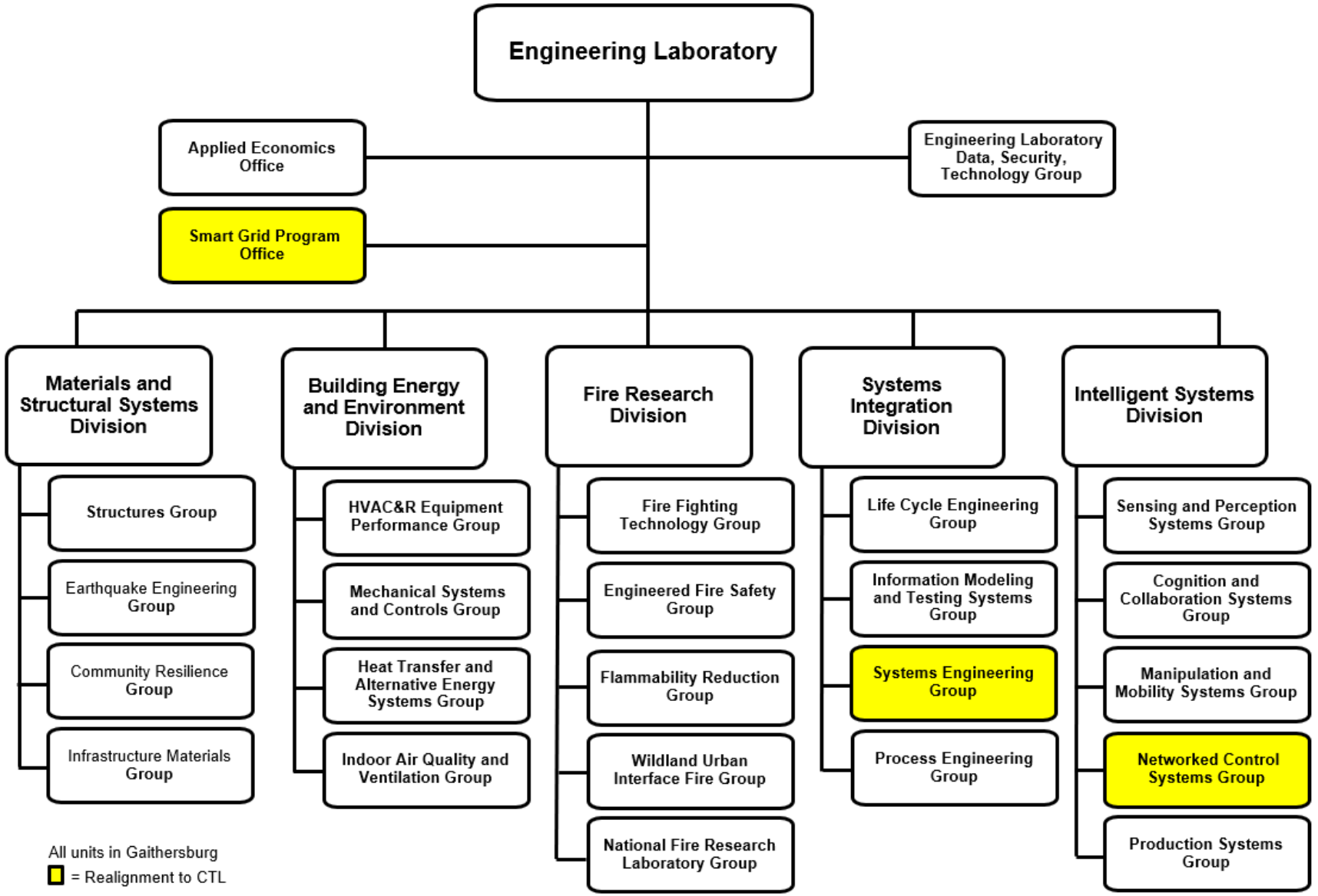
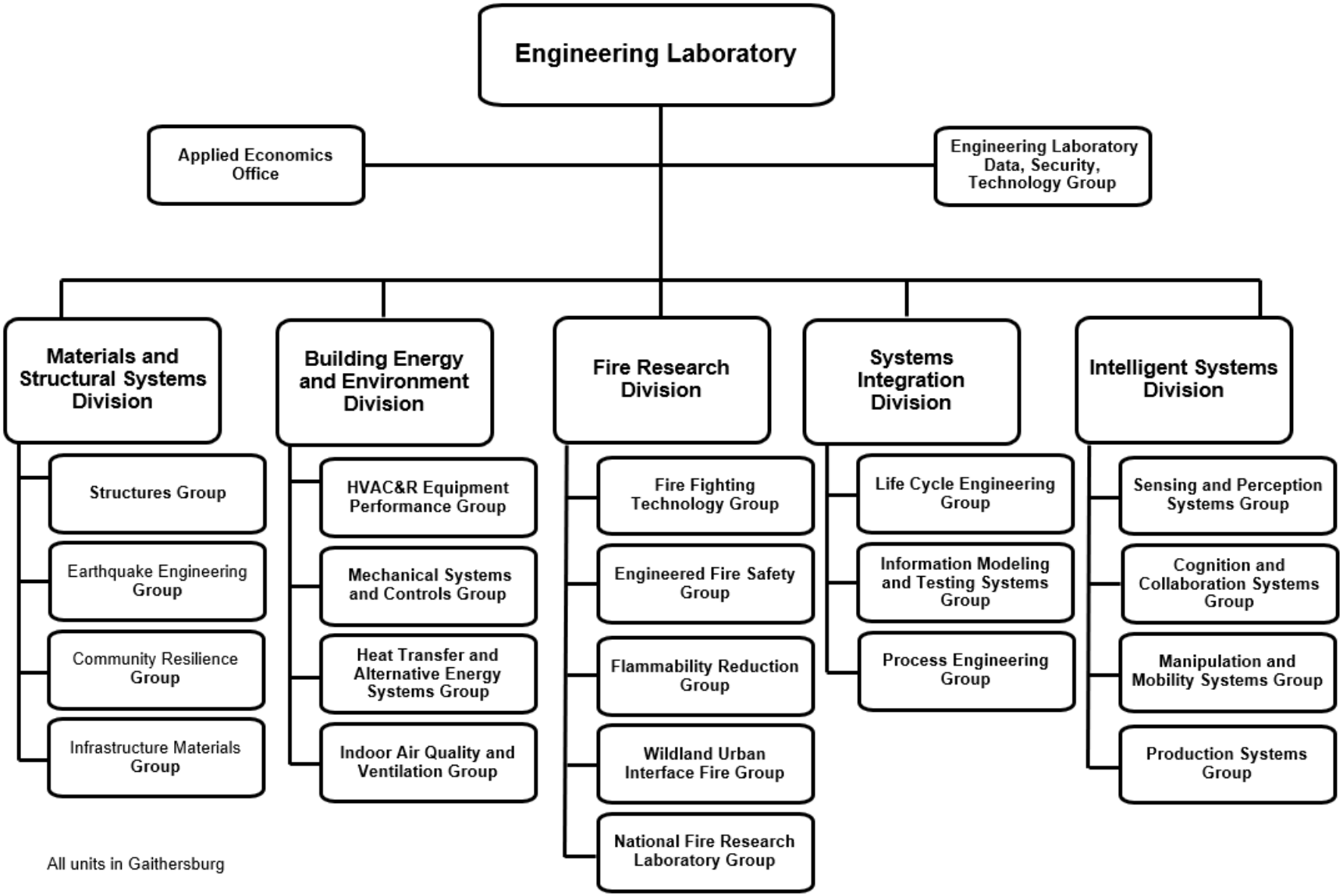


Engineering Laboratory

To Be:



All units in Gaithersburg

Information Technology Laboratory

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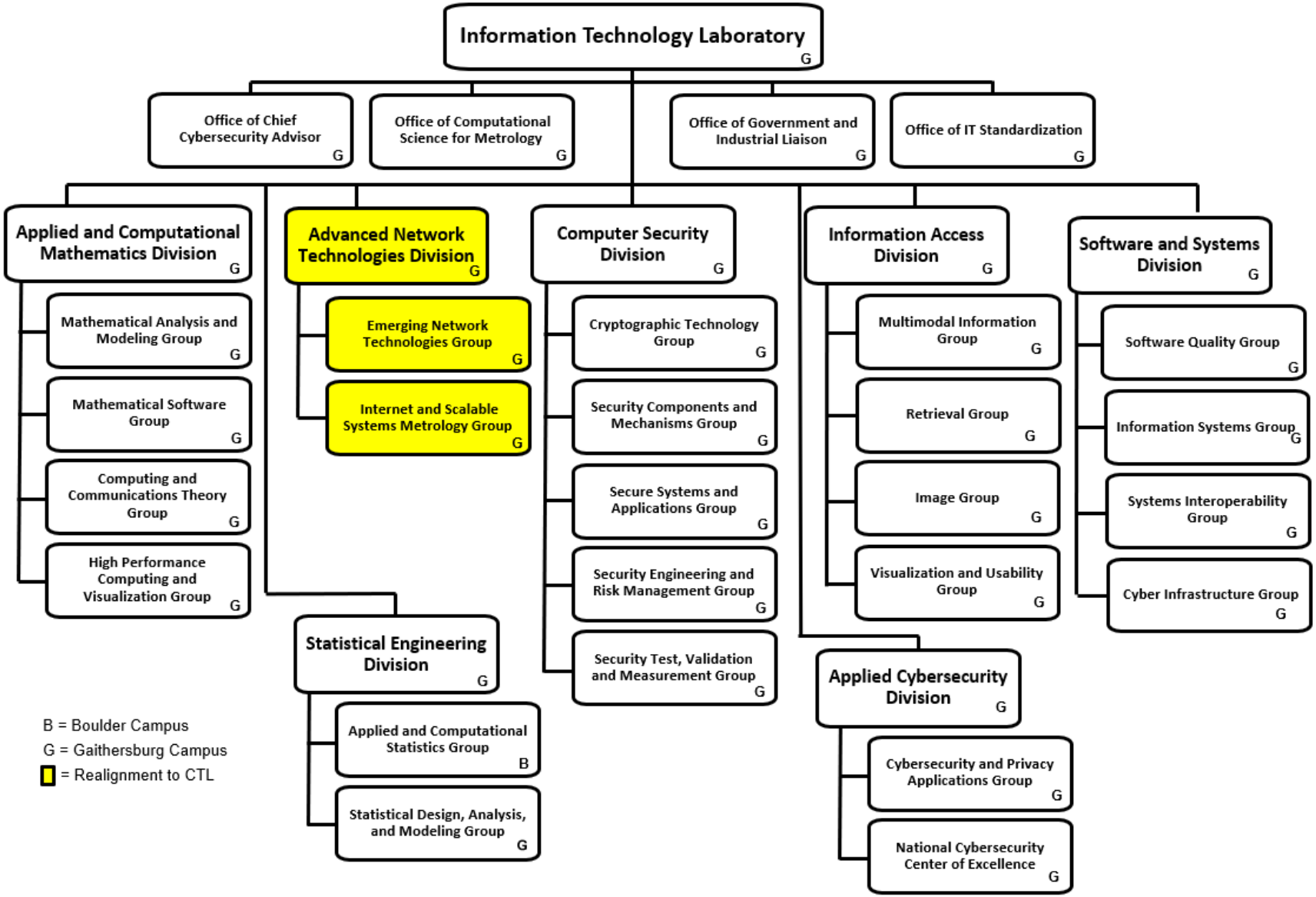
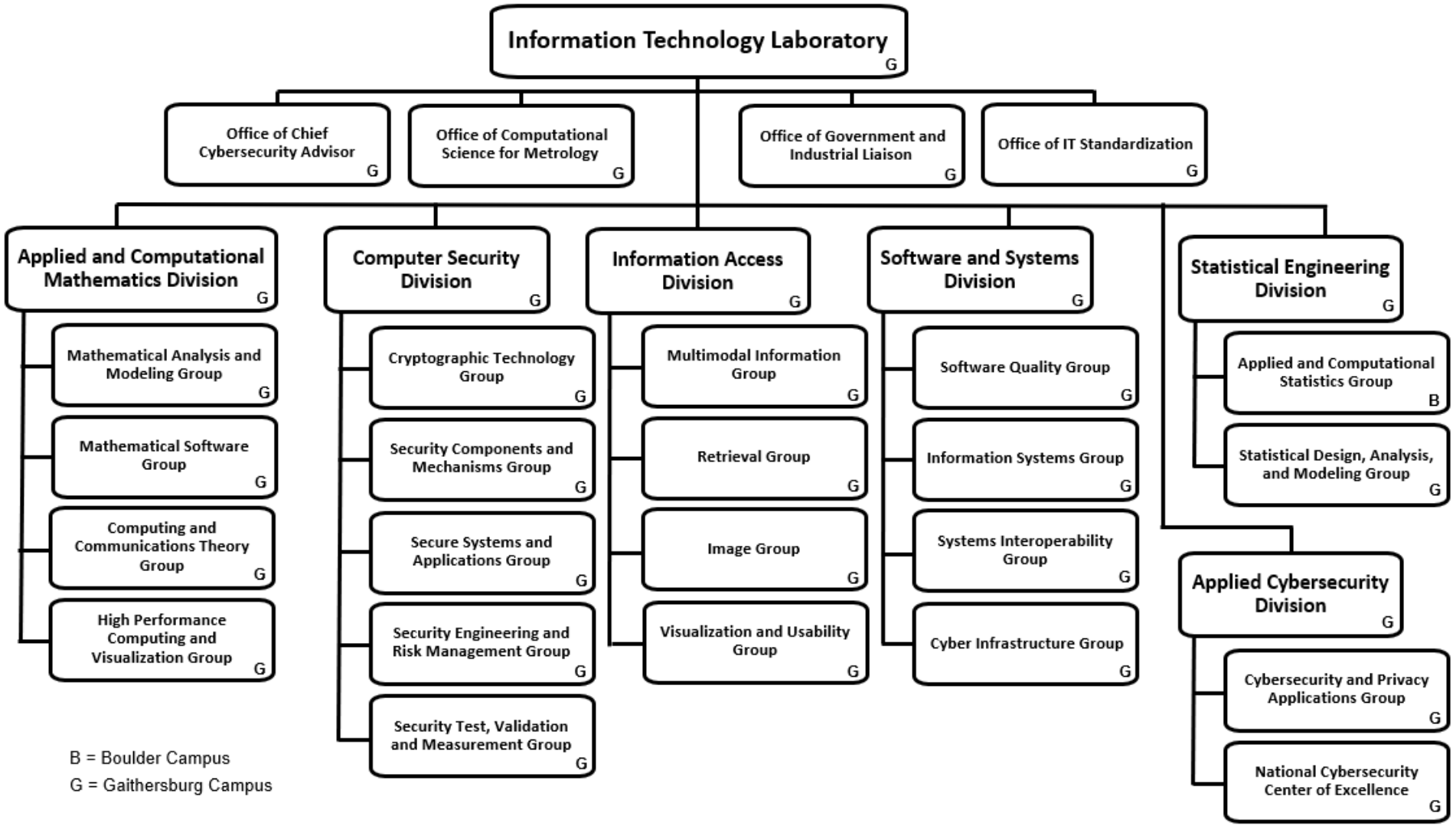


Information Technology Laboratory

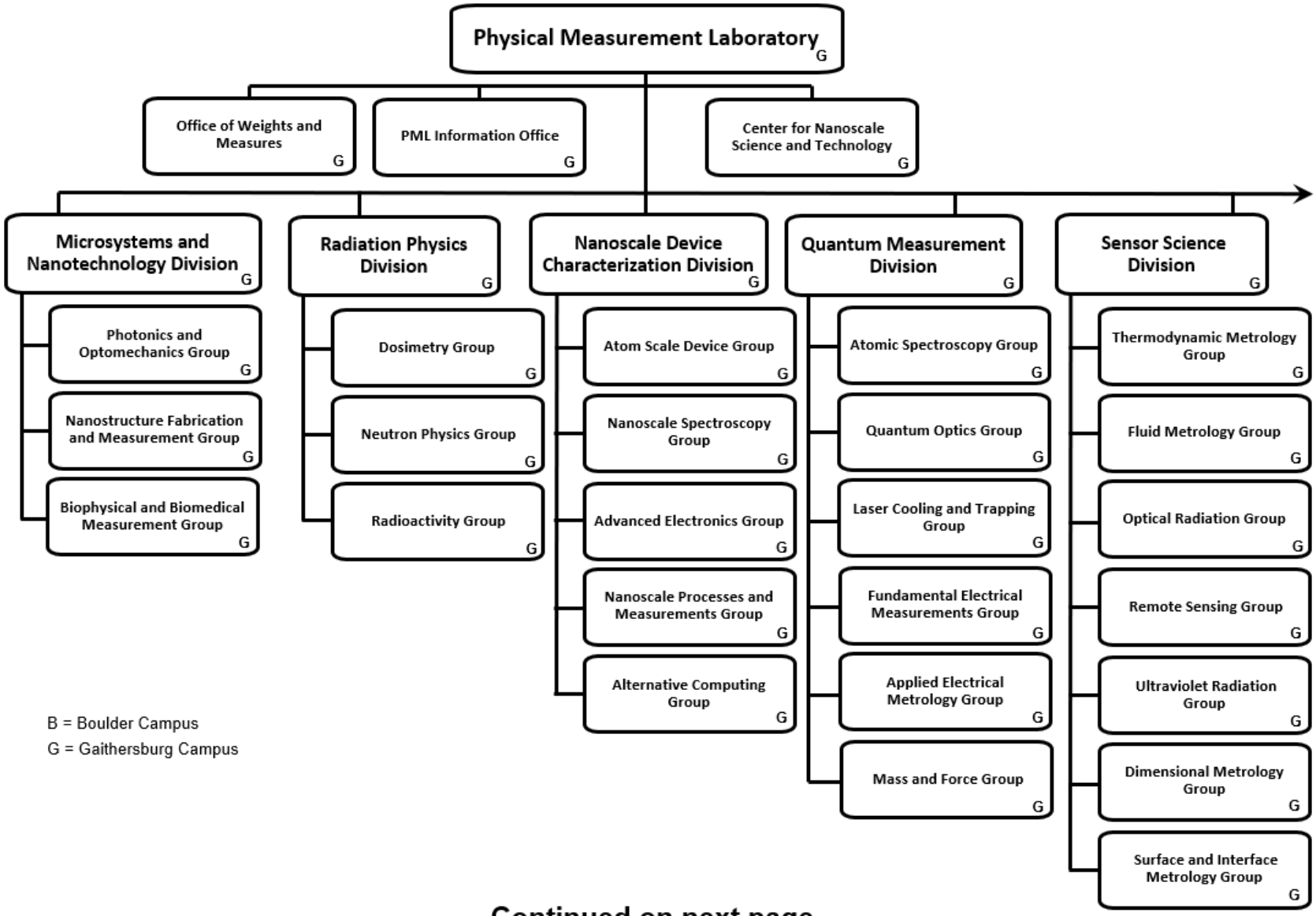
To Be:



B = Boulder Campus
G = Gaithersburg Campus

Physical Measurement Laboratory

As Is:



B = Boulder Campus
G = Gaithersburg Campus

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Physical Measurement Laboratory

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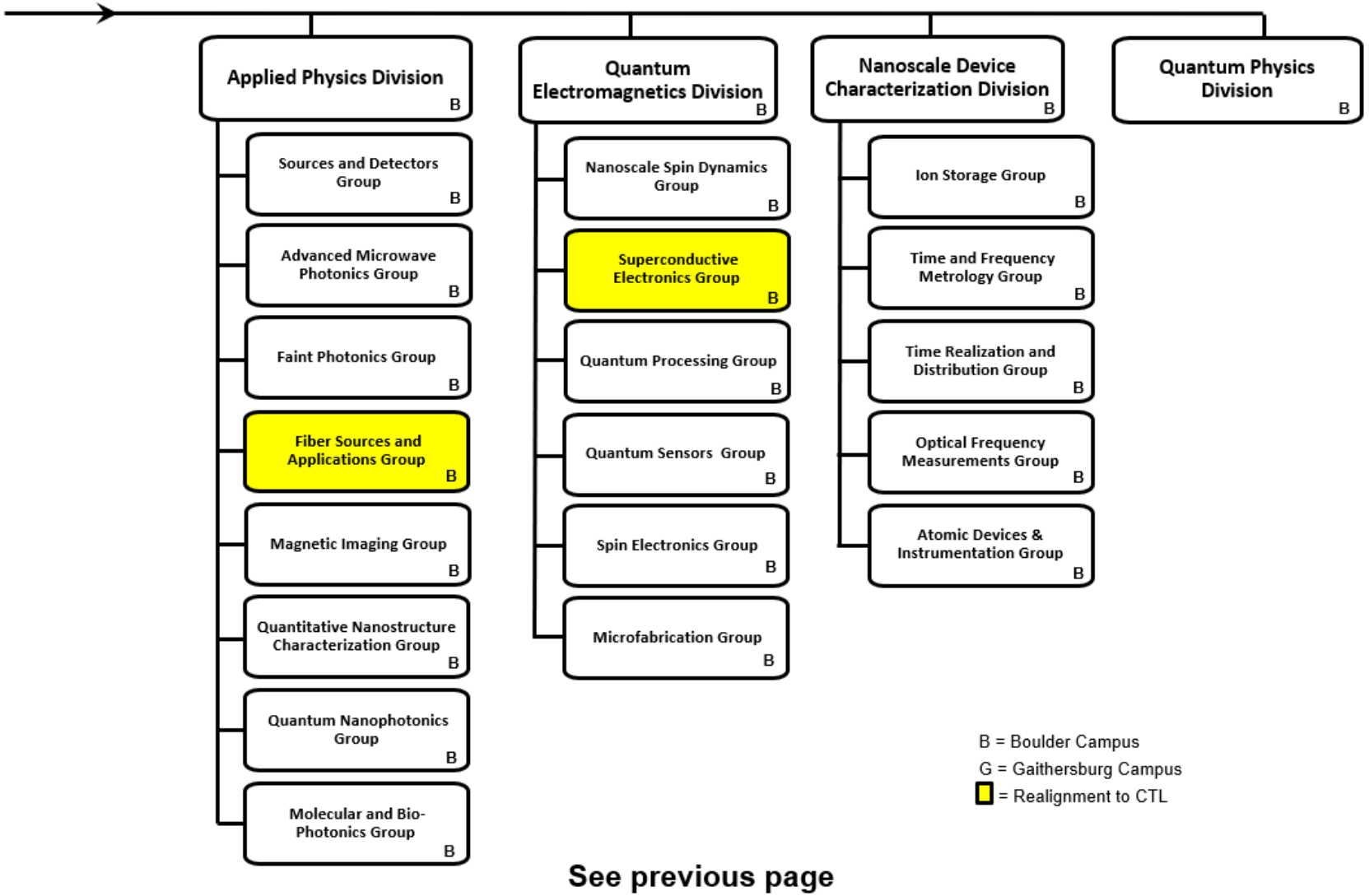

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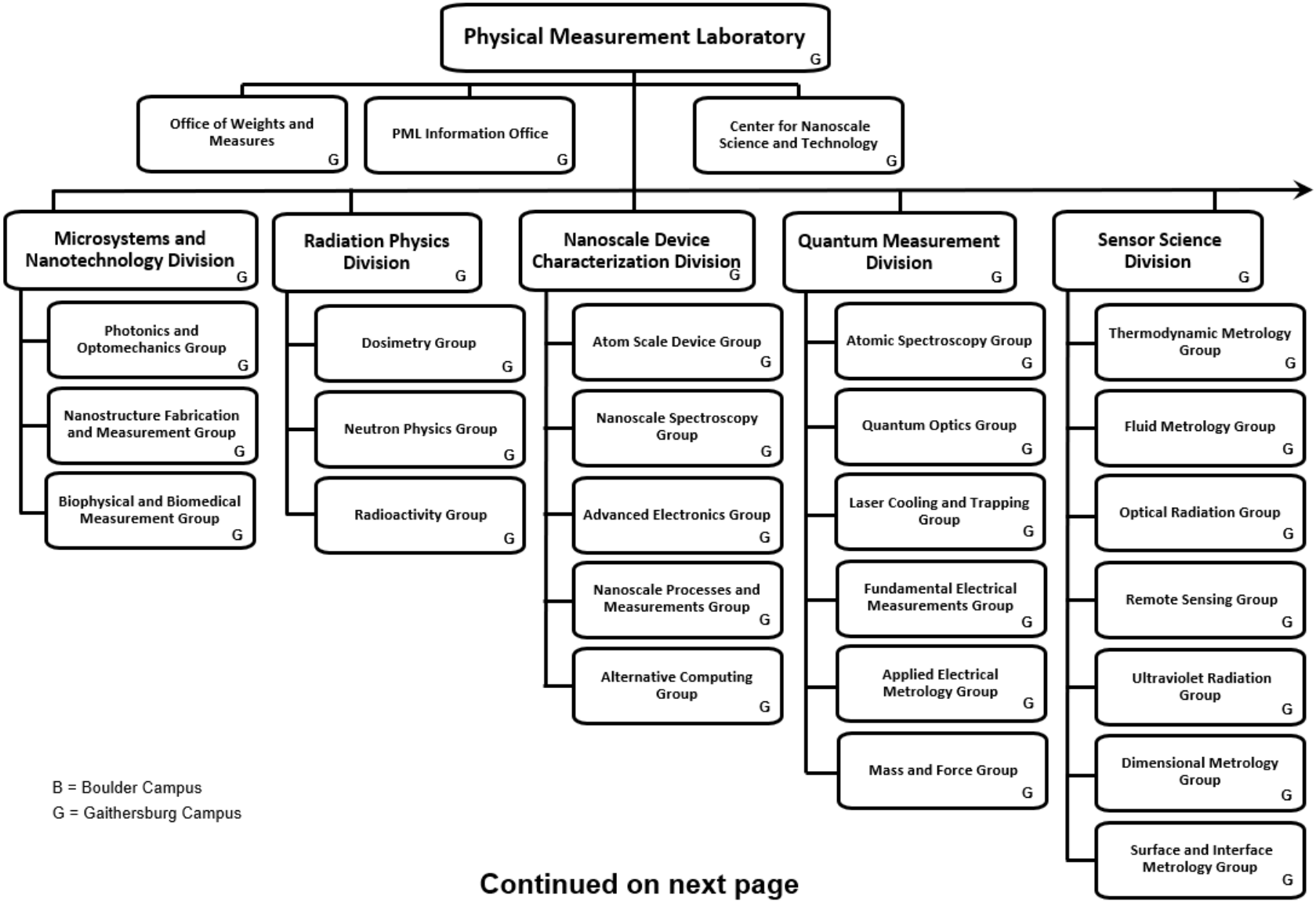
Physical Measurement Laboratory

To Be:



B = Boulder Campus
G = Gaithersburg Campus

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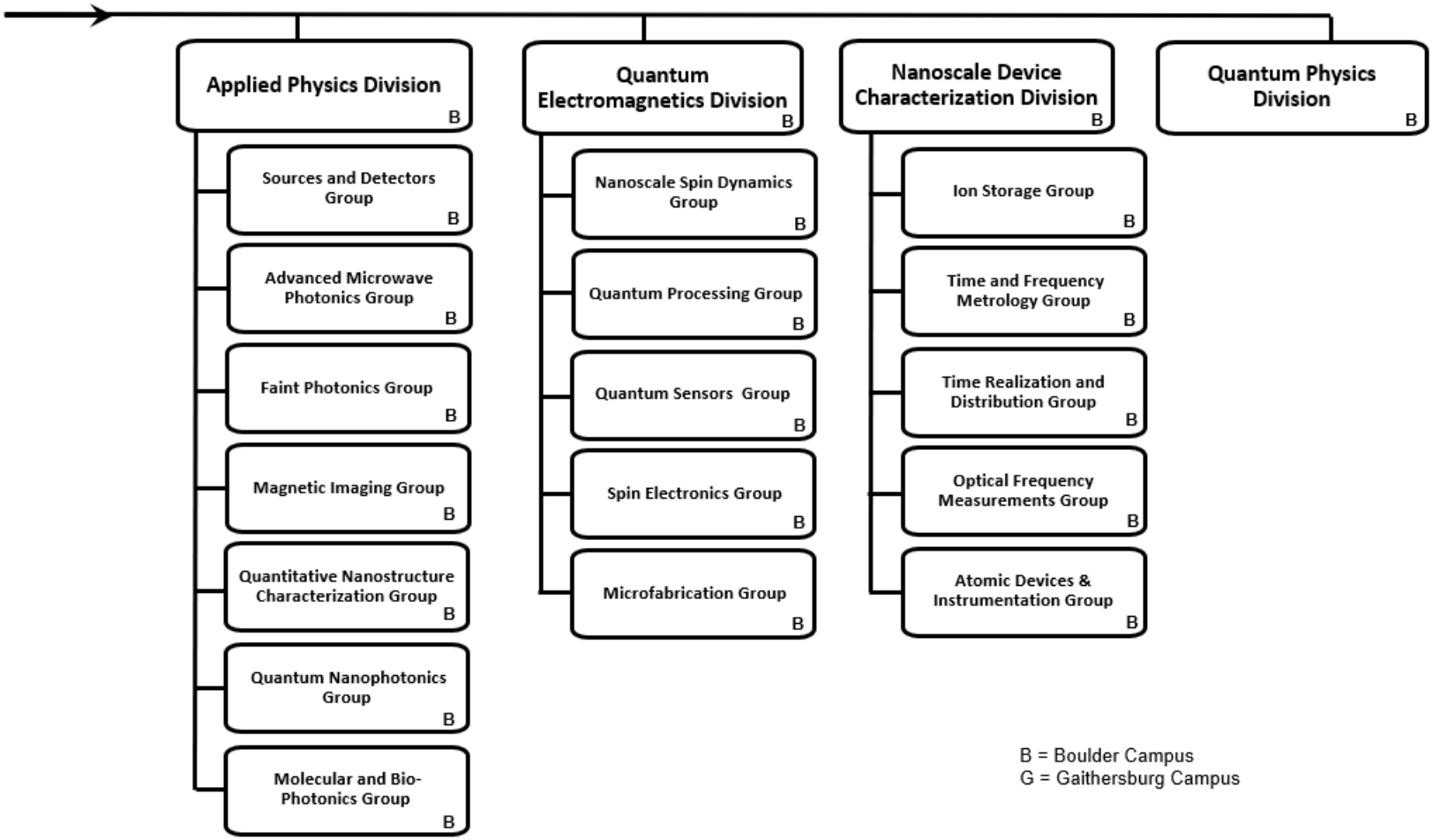
Physical Measurement Laboratory

To Be: (cont.)



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Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
TRANSFER CHANGE DETAIL BY OBJECT CLASS
(Dollar amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs Transfer to Department of Management Salaries and Expenses

	Object Class	2021 Enacted	2022 Transfer	2022 Base
11.1	Full-time permanent compensation	0	0	0
11.3	Other than full-time permanent	0	0	0
11.5	Other personnel compensation	0	0	0
11.9	Total personnel compensation	0	0	0
12	Civilian personnel benefits	0	0	0
13	Benefits for former personnel	0	0	0
21	Travel and transportation of persons	0	0	0
22	Transportation of things	0	0	0
23	Rent, communications, and utilities	0	0	0
23.1	Rental payments to GSA	0	0	0
23.2	Rental Payments to others	0	0	0
23.3	Communications, utilities and misc charges	0	0	0
24	Printing and reproduction	0	0	0
25.1	Advisory and assistance services	0	0	0
25.2	Other services from non-Federal sources	0	0	0
25.3	Other goods and services from Federal sources	($907)	($140)	($140)
25.5	Research and development contracts	0	0	0
25.7	Operation and maintenance of equipment	0	0	0
26	Supplies and materials	0	0	0
31	Equipment	0	0	0
32	Lands and structures	0	0	0
41	Grants, subsidies and contributions	0	0	0
43	Insurance claims and indemnities	0	0	0
43	Interest and dividends	0	0	0
99	Total obligations	(907)	(140)	(140)

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
TRANSFER CHANGE DETAIL BY OBJECT CLASS
(Dollar amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Corporate Services Transfer to Department of Management Salaries and Expenses

	Object Class	2021 Enacted	2022 Transfer	2022 Base
11.1	Full-time permanent compensation	0	0	0
11.3	Other than full-time permanent	0	0	0
11.5	Other personnel compensation	0	0	0
11.9	Total personnel compensation	0	0	0
12	Civilian personnel benefits	0	0	0
13	Benefits for former personnel	0	0	0
21	Travel and transportation of persons	0	0	0
22	Transportation of things	0	0	0
23	Rent, communications, and utilities	0	0	0
23.1	Rental payments to GSA	0	0	0
23.2	Rental Payments to others	0	0	0
23.3	Communications, utilities and misc charges	0	0	0
24	Printing and reproduction	0	0	0
25.1	Advisory and assistance services	0	0	0
25.2	Other services from non-Federal sources	0	0	0
25.3	Other goods and services from Federal sources	($11)	($2)	($2)
25.5	Research and development contracts	0	0	0
25.7	Operation and maintenance of equipment	0	0	0
26	Supplies and materials	0	0	0
31	Equipment	0	0	0
32	Lands and structures	0	0	0
41	Grants, subsidies and contributions	0	0	0
43	Insurance claims and indemnities	0	0	0
43	Interest and dividends	0	0	0
99	Total obligations	(11)	(2)	(2)

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
TRANSFER CHANGE DETAIL BY OBJECT CLASS
(Dollar amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Standards Coordination and Special Programs Transfer to Department of Management Salaries and Expenses

	Object Class	2021 Enacted	2022 Transfer	2022 Base
11.1	Full-time permanent compensation	0	0	0
11.3	Other than full-time permanent	0	0	0
11.5	Other personnel compensation	0	0	0
11.9	Total personnel compensation	0	0	0
12	Civilian personnel benefits	0	0	0
13	Benefits for former personnel	0	0	0
21	Travel and transportation of persons	0	0	0
22	Transportation of things	0	0	0
23	Rent, communications, and utilities	0	0	0
23.1	Rental payments to GSA	0	0	0
23.2	Rental Payments to others	0	0	0
23.3	Communications, utilities and misc charges	0	0	0
24	Printing and reproduction	0	0	0
25.1	Advisory and assistance services	0	0	0
25.2	Other services from non-Federal sources	0	0	0
25.3	Other goods and services from Federal sources	($80)	($12)	($12)
25.5	Research and development contracts	0	0	0
25.7	Operation and maintenance of equipment	0	0	0
26	Supplies and materials	0	0	0
31	Equipment	0	0	0
32	Lands and structures	0	0	0
41	Grants, subsidies and contributions	0	0	0
43	Insurance claims and indemnities	0	0	0
43	Interest and dividends	0	0	0
99	Total obligations	(80)	(12)	(12)

Department of Commerce
National Institute of Standards and Technology
FY 2022 PROGRAM INCREASES / DECREASES / TERMINATIONS
(Dollar amounts in thousands)
(By Appropriation, Largest to Smallest)

Increases

Page No In CJ	Appropriations	Budget Program	Title of Increase	Positions	Budget Authority
NIST- 120	Industrial Technology Services	Manufacturing USA	Fund Two Additional DOC Manufacturing USA Institutes	5	$149,957
NIST- 112	Industrial Technology Services	Hollings Manufacturing Extension Partnership	Hollings Manufacturing Extension Partnership Program	58	124,140
NIST- 149	Construction of Research Facilities	Safety, Capacity, Maintenance and Major Repairs	Repair and Revitalization of NIST Facilities	0	64,095
NIST- 64	Scientific and Technical Research and Services	Laboratory Programs	Climate and Energy Measurements, Tools and Testbeds	37	18,000
NIST- 37	Scientific and Technical Research and Services	Laboratory Programs	Quantum Information Science, Engineering, and Metrology	19	15,000
NIST- 42	Scientific and Technical Research and Services	Laboratory Programs	Partnerships, Research and Standards to Advance Trustworthy Artificial Intelligence (AI)	16	15,000
NIST- 52	Scientific and Technical Research and Services	Laboratory Programs	Supporting the American Bioeconomy	27	13,750
NIST- 47	Scientific and Technical Research and Services	Laboratory Programs	Advanced Communications Research and Standards	27	11,500
NIST- 56	Scientific and Technical Research and Services	Laboratory Programs	Next-Generation Semiconductor Research and Standards	11	10,000
NIST- 61	Scientific and Technical Research and Services	Laboratory Programs	Measurements and Data to Enable the Circular Economy	9	5,000

NIST- 90	Scientific and Technical Research and Services	Standards Coordination and Special Programs	Strengthening Equity and Diversity in the Standards Workforce	2	$3,003
NIST- 69	Scientific and Technical Research and Services	Laboratory Programs	Strengthening Equity and Diversity in the Standards Workforce	12	2,140
NIST- 87	Scientific and Technical Research and Services	Standards Coordination and Special Programs	Climate and Energy Measurements, Tools and Testbeds	2	2,000
NIST- 82	Scientific and Technical Research and Services	Standards Coordination and Special Programs	Advanced Communications Research and Standards	2	500
NIST- 85	Scientific and Technical Research and Services	Standards Coordination and Special Programs	Supporting the American Bioeconomy	0	250
	Total, Increases			227	434,335

Decreases

Page No In CJ	Appropriations	Budget Program	Title of Decrease	Positions	Budget Authority
NIST- 147	Construction of Research Facilities	Construction and major renovations	FY 2021 Studies Decrease	0	($6,095)
	Total, Decreases			0	(6,095)

Terminations

Page No In CJ	Appropriations	Budget Program	Title of Termination	Positions	Budget Authority
N/A					
	Total, Terminations				

Department of Commerce
National Institute of Standards and Technology
FY 2022 TRANSFER SUMMARY TABLE

(Dollar amounts in thousands)
(Grouped by Title of Transfer, Largest to Smallest)

Page No In CJ	Budget Program	Appropriations	Title of Transfer	Positions	Budget Authority
NIST-25	NIST	Scientific and Technical Research and Services	Transfer to Department Management Salaries and Expenses	0	($154)
		Total, Transfers		0	(154)

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Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
SUMMARY OF RESOURCE REQUIREMENTS
(Dollar amounts in thousands)

	Positions	FTE	Budget Authority	Direct Obligations	Appro-priation
Enacted, FY 2021	2,637	2,529	$791,000	$825,027	$788,000
Less: Unobligated balance from prior year	0	0	0	(34,027)	0
Less: Transfer from DoJ	0	0	(1,500)	(1,500)	0
Less: Transfer from EAC	0	0	(1,500)	(1,500)	0
2022 Adjustments to base:					
Annualization of positions financed in FY 2021	0	11			
Plus: Inflationary adjustments to base	0	0	31,427	31,427	31,427
2022 Base Request	2,637	2,540	819,427	819,427	819,427
Plus: 2022 Program changes	164	121	96,143	96,143	96,143
Plus: Transfer from DoJ	0	0	1,500	1,500	0
Plus: Transfer from EAC	0	0	1,500	1,500	0
2022 Estimate	2,801	2,661	918,570	918,570	915,570

Comparison by activity/subactivity with totals by activity		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease over 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Measurement Science, Services, and Programs											
Laboratory Programs	Pos./Approp	2,355	$655,767	2,401	$687,139	2,401	$715,591	2,559	$805,981	158	$90,390
	FTE/Obl.	2,186	655,358	2,305	706,976	2,315	715,591	2,433	807,481	118	91,890
Corporate Services	Pos./Approp	36	17,311	36	17,460	36	18,087	36	18,087	0	0
	FTE/Obl.	33	17,312	34	17,462	34	18,087	34	18,087	0	0
Standards Coordination and Special Programs	Pos./Approp	195	80,922	200	83,401	200	85,749	206	91,502	6	5,753
	FTE/Obl.	181	73,305	190	99,036	191	85,749	194	93,002	3	7,253
CARES Act (P.L. 116-136) - Laboratory Programs	Pos./Approp	0	6,000	0	0	0	0	0	0	0	0
	FTE/Obl.	6	4,447	0	1,553	0	0	0	0	0	0
TOTALS	Pos./Approp	2,586	760,000	2,637	788,000	2,637	819,427	2,801	915,570	164	96,143
	FTE/Obl.	2,406	750,422	2,529	825,027	2,540	819,427	2,661	918,570	121	99,143

	2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease over 2022 Base	
	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Adjustments for:										
Recoveries		($4,430)		0		0		0		0
Refunds		(41)		0		0		0		0
Unobligated balance, start of year		(16,980)		($34,027)		0		0		0
Unobligated balance, end of year		34,027		0		0		0		0
Unobligated balance, expired account		2		0		0		0		0
Budget Authority		763,000		791,000		$819,427		$918,570		$99,143
Financing from transfers:										
Transfers from DoJ for OLES (-)		(1,500)		(1,500)		0		(1,500)		(1,500)
Transfer from Election Assistance Commission (-)		(1,500)		(1,500)		0		(1,500)		(1,500)
Appropriation		760,000		788,000		819,427		915,570		96,143

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
ADJUSTMENTS TO BASE
(Dollar amounts in thousands)

	Perm. Pos.	FTE	Amount
Transfers:			
Transfer to Departmental Management Salary and Expenses	...	...	($154)
Other Changes:			
Annualization of FY 2021 pay raise	...	...	958
FY 2022 pay increase and related costs	...	...	9,093
Change in compensable days	...	...	0
Annualization of positions financed in FY 2021	0	11	
Awards	...	...	3,072
Personnel benefits:			
Civil Service Retirement System (CSRS)	...	...	91
Federal Employees' Retirement System (FERS)	...	...	3,001
Thrift Savings Plan (TSP)	...	...	8,737
Federal Insurance Contribution Act (FICA) - OASDI	...	...	66
Health insurance	...	...	759
Employees' Compensation Fund	...	...	74
Travel and transportation of persons:			
Mileage	...	...	(2)
Per Diem	...	...	0
Rental Payments to GSA including FIT costs	...	...	34
Communications, utilities, and miscellaneous charges:			
Electricity rate	...	...	(389)
Natural gas rate	...	...	259
Other services:			
Working Capital Fund (Departmental Management)	...	...	1,452
Commerce Business Systems (CBS)	...	...	209
Commerce Enterprise Services	...	...	(622)
Commerce Enterprise Infrastructure	...	...	274
Continuous Diagnostics and Mitigation Charges	...	...	300
NARA storage costs	...	...	3
Supplies and materials			
Scientific journal subscriptions	...	...	214
General pricing level adjustment	...	...	3,998
Subtotal, Other Changes	0	11	31,581
Total, Adjustments to base	0	11	31,427

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM AND PERFORMANCE: DIRECT OBLIGATIONS
(Dollar amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs

Line Item		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease over 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Strategic and Emerging	Pos./Approp	34	$21,320	45	$14,251	45	$14,767	45	$14,767	0	0
Research Initiative Fund	FTE/Obl.	28	15,430	40	19,932	42	14,767	42	14,767	0	0
National Measurement and	Pos./Approp	2,027	573,188 [1/]	2,062	604,659	2,062	629,240	2,206	714,490	144	$85,250
Standards Laboratories	FTE/Obl.	1,890	578,399 [1/]	1,982	618,694 [1/]	1,990	629,240	2,097	715,990	107	86,750
User Facilities	Pos./Approp	196	53,564	196	54,607	196	56,807	198	59,807	2	3,000
	FTE/Obl.	183	53,150	189	55,030	189	56,807	191	59,807	2	3,000
Postdoctoral Research	Pos./Approp	98	13,695	98	13,622	98	14,777	110	16,917	12	2,140
Associateship Program	FTE/Obl.	91	12,826	94	14,873	94	14,777	103	16,917	9	2,140
Total	Pos./Approp	2,355	661,767 [1/]	2,401	687,139	2,401	715,591	2,559	805,981	158	90,390
	FTE/Obl.	2,192	659,805 [1/]	2,305	708,529 [1/]	2,315	715,591	2,433	807,481	118	91,890

[1/] Numbers include supplemental CARES ACT appropriation for COVID-19 related expenses.

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
JUSTIFICATION OF PROGRAM AND PERFORMANCE
(Dollar amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs

Goal Statement

The goal of the NIST laboratory programs is to deliver world-class measurement science, standards, and technology to our stakeholders in industry, academia, and government to drive technological innovation that strengthens the economic and industrial competitiveness of the United States and improves our quality of life.

Base Program

The NIST laboratory programs work at the frontiers of measurement science, ensuring the U.S. system of measurements is firmly grounded on sound scientific and technical principles. The NIST laboratories address increasingly complex measurement challenges, ranging from the very small (quantum devices) to the very large (vehicles and buildings), and from the physical (resilient infrastructure) to the virtual (cybersecurity). As new technologies develop and evolve, NIST's measurement research and services remain central to innovation, productivity, trade, national security, and public safety.

The NIST laboratory programs provide industry, academia, and other federal agencies with:

- World class research capabilities in measurement science, forming the foundation of our global system of weights and measures and enable innovation;
- Basic and applied measurements, calibrations, and standards impacting every aspect of our economy and lives from the accuracy of airplane altimeters, to the reliability of clinical measurements, to the strength of the encryption technologies that protect our digital lives and businesses;
- Unbiased technical support for the development of industry-led, open, consensus-based documentary standards and specifications driving the deployment of advanced technology solutions and facilitate global commerce; and
- Unique, cutting-edge user facilities helping over 3,000 scientists from academia and industry move the state of the art forward in advanced materials, nanotechnology, bioscience, and other emerging technology areas.

NIST's mission is essential for U.S. commerce and global competitiveness. The Nation's founders knew the importance of weights and measures, that standards and technology are fundamental to effective commerce and trade, representing a critically important role of the Federal Government. Article 1 Section 8 of the Constitution gives the government the power to "fix the Standard of Weight and Measures," and Congress established the National Bureau of Standards (renamed NIST in 1988) to fill this role. This makes NIST, a National Metrology Institute, responsible for the dissemination of the fundamental units of measurement, the basis of international trade and commerce, and enabling scientific progress. NIST is the best in the world at performing its metrology mission. Other nations of the world are now seeking to gain advantage over U.S. leadership in

standards, technology and trade by making substantial investments in the work and facilities of their own National Metrology Institutes, such as those in China and Germany.

A clear example of the fundamental and infrastructural nature of NIST's mission space is NIST's work in the dissemination of the time and frequency standards. The dissemination of the time standard, traceable to NIST's atomic clock in Boulder, CO, underpins a tremendous amount of activity in our modern commercial system. For example, NIST official time is used to time-stamp hundreds of billions of dollars in U.S. financial transactions each working day. NIST time is also disseminated to industry and the public through the Internet Time Service which receives about 40 billion automated requests per day to synchronize clocks in computers and network devices. Additionally, other technological breakthroughs that we now take for granted are dependent upon the accuracy and precision of NIST's atomic clocks. This includes cellular telephones, Global Positioning System (GPS) satellite receivers, and the electric power grid.

Furthermore, the investment in the measurement science mission of NIST has proven to have a significant economic influence with a series of economic impact studies showing the average investment in NIST research has a direct benefit to cost ratio of 47:1.[1] That is, for every tax dollar invested in NIST, almost $50 of value is created in the economy annually.

There is no other private sector, or government entity with the capability, capacity, or mission to provide the types of services as those provided by NIST.

Examples of Accomplishments

Recent highlights of accomplishments from the laboratory programs include:

- Cybersecurity and Privacy: The popular NIST Framework for Improving Critical Infrastructure Cybersecurity, more widely known as the Cybersecurity Framework, focuses on industries vital to national and economic security, including energy, banking, communications and the defense industrial base. It has since proven flexible enough to be adopted voluntarily by large and small companies and organizations across all industry sectors, as well as by federal, state and local governments. NIST released finalized cybersecurity guidance for positioning, navigation and timing (PNT) services in February 2021. In March 2021, working with stakeholders including state election officials, the Election Assistance Commission, and the Department of Homeland Security, NIST published the *Draft Cybersecurity Framework Election Infrastructure Profile* (NISTIR 8310) to provide a road map to help election officials prepare for potential cyber threats; comments will be accepted through May 14, 2021.

  Building on the success of the Cybersecurity Framework, the *NIST Privacy Framework: A Tool for Improving Privacy through Enterprise Risk Management* (Version 1.0 released in January 2020) provides a voluntary tool for organizations to better identify, assess, manage and communicate about privacy risks. NIST hosted a workshop with the International Association of Privacy Professionals in September 2020 that explored challenges of growing a workforce capable of managing privacy risk. Following these findings, in April 2021 NIST announced a new working group called the *NIST Privacy Workforce Public Working Group* to bring practitioners together to address the need for skilled privacy

[1] https://www.nist.gov/director/summary-nist-laboratory-economic-impact-studies

professionals. The group will create a workforce taxonomy aligned with the Privacy Framework and the NIST *National Initiative for Cybersecurity Education Workforce Framework for Cybersecurity*. The NIST Cybersecurity for Internet of Things (IoT) program issued a number of non-regulatory guidance documents for federal agencies and IoT device manufacturers, including four drafts posted in December 2020 defining IoT cybersecurity requirements. The foundational documents offer recommendations to address challenges raised in the IoT Cybersecurity Improvement Act of 2020.

- Strengthening Cryptography: Current cryptographic algorithms rely on the fact that conventional computers have difficulty with factoring large numbers, which will no longer be the case when quantum computers enter the scene sometime in the near future. The possibility of quantum computing necessitates different mathematical tools to protect our information from quantum and conventional attacks. With these impending challenges in mind, NIST launched the multi-year Post-Quantum Cryptography (PQC) Standardization project with the goal of identifying quantum-resistant public-key cryptographic algorithms. The Round 3 candidates were announced July 22, 2020, and in 2020 NIST issued a status report detailing the process used for the second round evaluations as well as guidelines for third-round finalists. In February 2021, NIST opened registration for the Third PQC Standardization Conference, a virtual event planned for June 7-9, 2021, where each submission team of the 15 finalists and alternates are invited to present an update on their algorithms.

- Artificial Intelligence (AI): NIST continues to make progress on the recommendations in its 2019 report *U.S. Leadership in AI: A Plan for Federal Engagement in Developing Technical Standards and Related Tools*.[2] NIST launched a series of workshops on Exploring AI Trustworthiness including a kickoff on August 6, 2020, a workshop on Bias in AI on August 18, 2020, and one on Explainable AI January 26-28, 2021. In August, NIST issued a draft white paper *Four Principles of Explainable Artificial Intelligence* for public comment that was the focus of the January workshop. In 2021 with NIST's leadership, the Interagency Standards Policy Committee established a new AI subcommittee to bring together standards executives and practitioners from across government to discuss challenges and opportunities in AI standardization. NIST laboratories continue to make progress exploiting AI to advance measurement science for advanced communications, manufacturing robotics, materials science, and more. For example, a multi-institution team including NIST researchers developed an AI algorithm that discovered a new material without requiring additional training from scientists; the AI could dramatically reduce the amount of trial-and-error time scientists spend in the lab and lead to applications for new materials. The research team published its work in *Nature Communications* in November 2020.

- Bioscience: In 2020, NIST rapidly developed a research grade test material of synthetic fragments of the SARS-CoV-2 virus RNA, which is the target of diagnostic tests for COVID-19. The NIST material is being used to calibrate test equipment and perform quality checks of diagnostic assays, and can be used to benchmark new tests designed to detect the virus. In March 2021, NIST announced they had built a synthetic cell that grows and divides normally, working in collaboration with the J. Craig Venter Institute and the MIT Center for Bits and Atoms. The researchers identified seven genes that are key to ensuring the cells grow and divide in uniform shapes and sizes, a major advance in the field of engineering biology focused on harnessing the fundamental design rules of life.

- Advanced Communications: NIST is helping to build the crucial measurement infrastructure for emerging wireless systems for 5G and beyond, by developing new measurement methods and analysis tools and data. One new NIST resource is the 5G Spectrum Sharing Test Bed, an adaptable network that can measure how well 5G and older systems such as Wi-Fi, GPS, and military radar can operate without interfering with each other on increasingly crowded airwaves, an approach called spectrum sharing. Another resource, the NIST

[2] https://www.nist.gov/system/files/documents/2019/08/10/ai_standards_fedengagement_plan_9aug2019.pdf

Interoperability Test Bed, recently went through a 5G update. The facility lets researchers understand how radar, wireless, Wi-Fi and other systems interact in an integrated environment combining large anechoic and reverberation chambers. The National Advanced Spectrum and Communications Test Network (NASTCN) provides testing, modeling, and analysis with NIST traceability and uncertainty analyses. NASCTN has implemented six key spectrum sharing projects that brought together Commercial partners and federal agencies including the Department of Defense, NTIA, NOAA, NASA, and the National Science Foundation. In August 2020, engineers at NIST presented a new flexible, portable measurement system called SAMURAI (Synthetic Aperture Measurements of Uncertainty in Angle of Incidence) to test 5G devices across a wide range of signal frequencies and scenarios. SAMURAI provides measurements with exquisite accuracy but is small enough to be transported to field tests.

This small subset of recent accomplishments is representative of the diverse nature of scientific needs satisfied by NIST laboratory programs. Many more interesting accomplishments and industry impacts can be found at: https://www.nist.gov/director/pao.

Statement of Operating Objectives

Priority Objectives for FY 2022

NIST Laboratory Research Priorities

Throughout its history, NIST has provided new industries with foundational measurement tools that enhance reproducibility, interoperability, and reliability to accelerate innovation, adoption, and impact. With input from academia and industry, NIST has identified four strategic focus areas that will best position NIST drive innovation in support of America's economic security in the coming decades:

- *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 enable the Nation to realize the potential economic, societal, and innovation benefits that AI systems offer to consumers.
- *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 to support the U.S. bioeconomy through building next generation measurement science (biometrology) capabilities and engineering biology laboratories for accelerating responsible biotechnology innovations.
- *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 technologies and applications.

NIST has prioritized the work of its laboratories with these emerging technology areas, in addition to focusing on continuing priorities around cybersecurity, communications, and advanced manufacturing.

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 Wi-Fi 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.

Explanation and Justification

Line Item		2020 Actual		2021 Enacted		2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Laboratory Programs	Pos./BA	2,355	$655,767	2,401	$687,139	2,401	$715,591
	FTE/Obl	2,186	655,358	2,305	706,976	2,315	715,591

Laboratory Programs (FY 2022 Request by Program Area shown below. Total Funding: $715.6 million and 2,401 Positions)

NIST Laboratory Programs focus on the following mission functions and programmatic areas:

Exploratory Measurement Science ($73.7 million) – 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 programs. NIST invests in higher-risk and potentially transformative measurement science research to stay on the cutting edge of science and technology trends. NIST's exploratory research accelerates innovation in emerging areas. Examples of efforts in this area include: (1) in support of Executive Order on Strengthening National Resilience through Responsible Use of Positioning, Navigation, and Timing Services, NIST will continue its groundbreaking research in ultra-precise optical clocks. NIST continues development of transportable optical clocks based on ytterbium atoms and is starting a new program in optical clock based on a single strontium ion; (2) uniting a team of NIST researchers in the expertise of wireless communications, manufacturing, cybersecurity, and AI, to create 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 their wireless Industrial Internet of Things technologies and networks.

Advanced Manufacturing and Material Measurements ($124.1 million) – 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 support the Administration's *"Strategy for American Leadership in Advanced Manufacturing"*[3] by enabling the development of a strong U.S. manufacturing base that is essential to our economic and national security.

[3] https://www.whitehouse.gov/wp-content/uploads/2018/10/Advanced-Manufacturing-Strategic-Plan-2018.pdf

Fundamental Measurement, Quantum Science, and Measurement Dissemination ($205.8 million) – The NIST 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, provides NIST-traceable calibrations, and disseminates standards and best practices throughout the Nation. The NIST laboratories address increasingly complex measurement challenges as new technologies develop and evolve. NIST's measurement research and services remain central to innovation, productivity, trade, national security, and public safety. 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. This research, combined with NIST's expertise in advanced materials, nanofabrication, and microelectronics, and our network of joint institutes (JILA, and JQI) and the Quantum Economic Development Consortium make NIST a true hub of quantum innovation. In FY 2022, NIST will continue to focus a portion of its quantum research portfolio on Quantum Network Grand Challenge. The goal of the challenge is to demonstrate the ability to transmit quantum information between multiple quantum devices and sensors securely and efficiently, as the full economic and security benefit of quantum technologies is dependent upon the ability to do so.

Advanced Communications, Networks, and Scientific Data Systems ($77.7 million) – NIST's Advanced Communications, Networks, and Scientific Data Systems activities 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 and National Public Safety Broadband Network. These technologies will be necessary for self-driving cars, internet of things (IoT) applications, drones, future AI systems, and public safety with enhanced capabilities. 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.

Cybersecurity and Privacy ($81.9 million) – NIST is the DOC 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. For example, NIST's work in reducing the cybersecurity risk of global supply chains is critical as U.S. is recovering from the COVID-19 pandemic. NIST's sustained outreach supports the effective application of standards and best practices enabling the adoption of practical cybersecurity and privacy. 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.

Health and Biological Systems Measurements ($36.0 million) – NIST is paving the way for a vibrant U.S. biotechnology market by advancing and developing measurement science, standards, data and technology to accelerate the development, manufacturing, and regulatory approval of innovative, high-quality biologic medicines. As a non-regulatory agency, 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. A goal of synthetic biology program at NIST is to harness the power of complex biological systems (primarily cells) in a predictable and safe way for the manufacture of advanced therapeutics, sustainable fuels, chemical feedstocks, and advanced materials.

Physical Infrastructure and Resilience ($60.6 million) – 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 natural disasters, 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. In collaboration with industry and academia, NIST performs research into novel materials, tools, instruments, and protocols to provide technical foundation to standards and codes and to support innovation.

NIST User Facilities ($55.8 million) – 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.

The ongoing research and development work outlined above are performed by the six NIST laboratory organizational units which house the staff and facilities necessary to conduct and deliver the ground-breaking measurement science, standards, and technology work in the focus areas.

The six laboratories are in Gaithersburg, Maryland and Boulder, Colorado. Additional information on recent activities specific to each of these laboratories can be found online through the web sites provided below:

- Communications 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. CTL work establishes the metrological foundations for higher speeds, better connections and more ubiquitous access amid rising wireless demand. With expertise honed over decades of theoretical and experimental work in antennas and wireless propagation, materials science, and electronics measurement and testing, CTL is an independent, unbiased arbiter of trusted measurements and standards to government and industry. CTL focuses efforts in establishing vital technological foundations for the ongoing wireless revolution across four focus areas:
  - Public Safety Communications Research – Driving innovation and conducting research that enables the development of performance-based standards for first responder communications;
  - Trusted Spectrum Testing– Facilitating and coordinating spectrum sharing and related engineering capabilities while creating a trusted capability for spectrum sharing evaluations;
  - Next Generation Communications for 5G and Beyond– Advancing measurement science for next generation wireless systems including characterizing millimeter wave (mmWave) radio channels and performance assessment; and
  - Fundamental Metrology for Communications – Developing theory, measurements, and standards for the next generation of RF and other technologies that will underpin the future of wireless communications.

  https://www.nist.gov/ctl

- Engineering Laboratory (EL): The Engineering Laboratory 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. EL's studies of the scene of major disasters guide research and develop recommendations for design and construction practices to reduce hazards. NIST validates research in realistic end-use scenarios using EL's unique test facilities, including the National Fire Research Laboratory that uniquely combines large scale, realistic environment, and structural loads to study the fire behavior of buildings and construction materials; the Robotics Test Facility for evaluating robotic sensing, manipulation, endurance, and search and rescue performance; and the Net-Zero Energy Residential Facility, a testbed for combining and assessing new home-scale energy technologies in a realistic environment. EL research and facilities focus on four strategic goal areas:
  - Disaster Resilient Buildings, Infrastructure, and Communities– Advancing the engineering of the built environment to enhance the resilience of U.S. buildings, communities, and infrastructure to earthquakes, wind, and fire;
  - Smart Manufacturing – Advancing information exchange, interoperability, and control systems for manufacturing, including robotics and additive manufacturing;
  - Sustainable and Energy-Efficient Manufacturing, Materials, and Infrastructure– Advancing the engineering of sustainable and energy efficient materials, products, and systems used in buildings and building construction; and
  - Cyber-Physical Systems – Advancing the engineering that accelerates the development of reliable, resilient, and efficient cyber-physical systems, including the Smart Grid.

  https://www.nist.gov/el

- Information Technology Laboratory (ITL): The Information Technology Laboratory develops and deploys standards, tests, and metrics to make the Nation's information systems more secure, usable, interoperable, and reliable. ITL's strategy is to maximize the benefits of IT to society through a balanced IT measurement science and standards portfolio of three major activities: fundamental research in mathematics, statistics, and IT; applied IT research and development; and standards development and technology transfer. ITL identifies emerging and high-priority technologies, conducts path-breaking research to advance our understanding of their limits and capabilities and potential applications, and develops security and privacy solutions that have a high impact on the U.S. critical infrastructures. 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 – Bridging foundational and applied cybersecurity and privacy research and development and cybersecurity operations through the development of standards and technical guidance;
  - Artificial Intelligence – Leading federal efforts in AI-related standards development and driving new developments in understanding foundational aspects of trustworthy AI;
  - Information Science – Improving the reliability of human-computer interactions, video analytics, data science, and biometrics, and usability of these technologies in areas of national importance; and
  - Quantum Information – Analyzing quantum algorithms and developing benchmarks for quantum computer performance.

  https://www.nist.gov/itl

- Material Measurement Laboratory (MML): The Material Measurement Laboratory is the national reference laboratory for measurements in the chemical, biological, and material sciences. MML conducts research on the composition, structure, and properties of industrial, biological, and environmental materials and processes. MML develops tools such as reference measurement procedures, certified reference materials, and critically evaluated data and best-practice guides used by U.S. industry to assure measurement quality and improve process efficiency. This work improves U.S. competitiveness in an increasingly challenging global environment. MML enables measurements in areas of national importance, including:
  - Advanced Materials – Providing a gateway to new discoveries that involve nanomaterials, advanced electronics, structural steels, complex fluids, and more through the development of testbeds, measurements, models, and data;
  - Energy and Climate – Research and standards to advance next-generation climate measurements, and carbon capture approaches to mitigate climate change;
  - Health Care – Enhancing technology realization in clinical diagnostics, regenerative medicine, measurement services to ensure food nutrition and safety, and driving advances to enable applications of engineering biology;
  - Infrastructure – Developing methods to test and predict the health of physical infrastructure from bridges and buildings and the materials used to build them, as well as fuel pipelines and water infrastructure;
  - Manufacturing – Accelerating development of lightweight alloys for fuel-efficient automobiles biomanufacturing, and chemical manufacturing; as well as new measurements and standards for product sustainability and recycling to support the circular economy; and
  - Safety, Security, and Forensics – Providing tools to help forensic crime laboratories validate their analytical methods and ensure accuracy in their results for DNA and biological evidence, fingerprint and pattern evidence, illicit drugs, digital evidence, ballistics, and trace evidence.

  https://www.nist.gov/mml

- NIST Center for Neutron Research (NCNR): The NIST Center for Neutron Research is one of the Nation's premier neutron research facilities. The NCNR typically provides 250 days of reactor operation annually, serves over 2,500 researchers from 165 organizations and labs, and accounts for over half of all U.S. neutron research. The remainder of the year is dedicated to the mandatory maintenance and refueling of the reactor, as it is critical that the research reactor operates in a safe and reliable manner to support the NCNR mission. The NCNR is operated as a national user facility using a peer-reviewed, merit-based proposal approach. To address science and engineering problems of major interest, the NCNR continually invests in developing state-of-the-art neutron measurement capabilities, including:
  - Cold Neutrons – NCNR optimizes cold neutrons for studying the structure of materials including polymers, pharmaceuticals, and magnetic materials, a capability constantly evolved through upgrades in enhanced productivity for a variety of techniques;
  - Neutron Scattering – Users of the NCNR can probe the structure of materials at the nanometer scale through neutron, scattering techniques. NCNR expanded this capability in 2017 with the installation of an NCNR-developed energy-dispersive detector that has dramatically improved the ability to understand complex structures and structure-property relationships. This is transforming new materials development and discovery which is particularly useful for emerging technologies;

- Neutron Imaging – NCNR is increasing its outstanding neutron imaging capabilities – which are uniquely able to image light elements, like hydrogen and lithium, and can help researchers optimizing fuel cell and battery designs - a new cold neutron microscope under development; and
- Powerful Partnerships – NCNR develops instrumentation in partnership with other agencies and stakeholders, including the Center for High Resolution Neutron Scattering, co-funded with National Science Foundation, and the private-public nSoft Consortium (established by NIST) focused on soft-matter research.

https://www.nist.gov/ncnr

- Physical Measurement Laboratory (PML): The Physical Measurement Laboratory 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. To achieve its mission, PML draws on its core capabilities to advance, realize, and disseminate the complete range of physical measurements, covering every unit of the International System of Units (SI) and thus affecting nearly every aspect of modern life. To maintain state-of-the-art capabilities in realizing, disseminating, and measuring these quantities, PML invests in fundamental scientific research to push the boundaries and prepare for next-generation measurement needs. This measurement expertise also helps America address key technical challenges in:
  - Manufacturing – Helping industry improve efficiency by providing measurement solutions, researching new embedded standards, and facilitating the commercialization of NIST-pioneered technologies through the NIST on a Chip Program;
  - Energy – Enabling effective transition to solid state lighting and initiating research to support advanced electric grid, hydrogen fuel cell and rechargeable battery technologies;
  - Advanced Microelectronics – NIST is a crucial partner to the U.S. microelectronics industry, working with them to understand and address technical challenges for future electronics such as 2D materials, advanced packaging, and atomic-scale defects;
  - HealthCare – Providing traceability for medical diagnostics, nuclear medicine treatments, and expanding capabilities into new modalities, like hyperspectral imaging; and
  - Quantum science – Leading research in quantum states, photonics, quantum information, quantum computation, and leading the transition to quantum-based measurements.

https://www.nist.gov/pml3

In addition to this base request, NIST is requesting $90.4 million in initiative increases described in further detail below.

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Quantum Information Science, Engineering, and Metrology	Pos/BA	82	$46,800	101	$61,800	19	$15,000
	FTE/Obl.	82	46,800	96	61,800	14	15,000

Quantum Information Science, Engineering, and Metrology (+$15,000, +14 FTE/+19 Positions) - NIST requests $15 million to expand the world-leading NIST quantum information science (QIS) program. Building on NIST's considerable expertise, the request will create the foundation for quantum technologies and the nascent field of quantum engineering, as well as establish the metrology to support next-generation research and future U.S. quantum industry. NIST will expand key research partnerships and capabilities, develop new quantum measurements and enabling technologies, and support a NIST quantum networking testbed. These components are needed to define robust quantum supply chains, a goal of the Quantum Economic Development Consortium (QED-C) established by NIST as part of the National Quantum Initiative (NQI). These additional investments, coupled with NIST's world-leading expertise, can transform NIST into a hub for quantum technologies and help solidify U.S. "quantum supremacy."

The request provides resources to help address a key obstacle to progress in this area: a lack of quantum engineering capabilities for U.S. researchers to more rapidly create, test, and validate potential platforms. The majority of the funding ($9.5 million) will go towards quantum engineering to support creating the quantum engineering ecosystem essential to create the industrial base for this future technology, train the future workforce, and transfer NIST technological knowledge to industry. NIST will expand its quantum network testbed program that supports the National Science and Technology Council report *A Coordinated Approach to Quantum Networking Research* through the development of standards and benchmarks for future quantum technologies by establishing free-space and wired optical communication testbeds.

This funding will also initiate a coordinated effort in quantum materials design and characterization through development of a quantum materials program and new instrumentation needed for developing neutron-based measurement technologies to rapidly advance the development of new quantum materials. Quantum breakthroughs will allow NIST to redefine how weights and measures are disseminated, improving accuracy and precision while eliminating costly and time-consuming calibration chains. Resources of $2.5 million will expand the NIST-on-a-Chip program to bring quantum-based cutting-edge measurement-science technology and expertise from the lab to real-world users in industry and mission agencies in the Federal Government. Additionally, this initiative will allow NIST to leverage and build upon its foundational successes such as the quantum logic clock, near quantum-limited amplification of weak signals, and characterization of quantum many-body systems, and the pioneering of quantum simulation. Resources of $3.0 million will be for foundational quantum science and metrology so that NIST can exploit the benefits of quantum information science for improved measurement capabilities, strengthening their partnerships with quantum institutions, and supporting the quantum workforce.

The request increases NIST's investment in its Fundamental Measurement, Quantum Science, and Measurement Dissemination portfolio by $15.0 million.

Performance Measure: Development of standards and benchmarks from testbed establishment in both Gaithersburg and Boulder that can be used by quantum network participants.

	2022	2023	2024	2025	2026
With increase	3	6	10	15	21
Without increase	1	2	3	3	4

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE PERSONNEL DETAIL

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Quantum Information Science, Engineering, and Metrology

Full-time permanent					
Title		Grade	Number	Annual Salary	Total Salaries
Physicist		ZP V	1	$144,128	$144,128
Electrical Engineer		ZP IV	1	122,530	122,530
Materials Scientist		ZP IV	1	122,530	122,530
Physicist		ZP IV	4	122,530	490,120
Chemist		ZP III	1	87,198	87,198
Electrical Engineer		ZP III	1	87,198	87,198
NRC Postdoctoral Fellow		ZP III	4	87,198	348,792
Physicist		ZP III	4	87,198	348,792
Administrative/Technical Support		ZA II	2	66,216	132,432
Total			19		1,883,720
Less lapse	25.00%		(5)		(470,930)
Total full-time permanent (FTE)			14		1,412,790
2022 pay Adjustment (2.7%)					38,145
					1,450,935
Personnel Data Summary					
Full-time Equivalent Employment (FTE)					
Full-time permanent			14		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total FTE			14		

Authorized Positions					
Full-time permanent			19		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total Positions			19		

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE DETAIL BY OBJECT CLASS
(Direct Obligations amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Quantum Information Science, Engineering, and Metrology

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$256,282	$273,955	$279,340	$280,791	$1,451
11.3	Other than full-time permanent	20,408	21,285	21,703	21,703	0
11.5	Other personnel compensation	6,807	7,012	10,043	10,043	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	283,497	302,252	311,086	312,537	1,451
12.1	Civilian personnel benefits	93,447	99,683	114,356	114,826	470
13	Benefits for former personnel	27	27	27	27	0
21	Travel and transportation of persons	3,717	3,847	9,444	9,553	109
22	Transportation of things	982	1,038	1,059	1,111	52
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	119	113	143	143	0
23.2	Rental payments to others	2,009	2,049	2,090	2,090	0
23.3	Communications, utilities, and misc. charges	15,243	16,893	16,811	18,409	1,598
24	Printing and reproduction	344	426	435	472	37
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	1,866	1,759	1,611	1,611	0
25.2	Other services from non-Federal sources	42,845	57,504	31,510	33,718	2,208
25.3	Other goods and services from Federal sources	32,588	31,717	33,067	33,614	547
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	38,405	39,685	40,491	40,491	0
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	21,791	21,947	22,394	22,691	297
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	20,915	22,105	22,686	23,832	1,146
31	Equipment	41,353	42,004	42,901	45,186	2,285
32	Lands and structures	9	9	9	9	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	60,648	65,471	65,471	70,271	4,800
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	659,805	708,529	715,591	730,591	15,000

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Partnerships, Research, and Standards to Advance Trustworthy Artificial Intelligence	Pos/BA	22	$30,420	38	$45,420	16	$15,000
	FTE/Obl.	22	30,420	34	45,420	12	15,000

Partnerships, Research, and Standards to Advance Trustworthy Artificial Intelligence (+$15,000, +12 FTE/+16 Positions) - NIST requests $15 million to expand its Artificial Intelligence (AI) program to include a new AI Collaborative Institute, and increase technical expertise in laboratory efforts that are exploiting AI in applications including advanced manufacturing and communications. Advances in AI promise transformative technologies and scientific breakthroughs that will improve our lives in many ways, such as driverless cars, smart buildings, automated health diagnostics, and improved security monitoring. With investments in AI exploding globally, companies, governments, and policy makers around the world are seeking answers that can provide greater confidence in technologies that rely on AI – for which the worldwide market in 2020 was $40 billion, and is anticipated to grow to over $190 billion by 2025.[4]

Of the amount requested, $10 million will be used to establish a new public-private partnership with academia, industry, and government to accelerate technically sound standards and solutions for trustworthy AI. This institute partnership would be a major step toward achieving several important goals in NIST's report, *U.S. Leadership in AI: A Plan for Federal Engagement in Developing Technical Standards and Related Tools*, by fostering deeper, consistent, and long-term engagement in AI research and standards development. To meet the expectations and requirements of the community to produce needed AI measurement and standards-related deliverables, NIST must look externally to increase capabilities and capacity; the institute is envisioned as a consortium of several public and private organizations, working together to identify and address common challenges to the wide-scale deployment of trustworthy AI systems and technologies.

Resources of $5 million will be used to expand NIST research capacities to build the confidence and trust in AI systems necessary for U.S. businesses to take full advantage of transformational technologies. NIST will grow its technical staff to further its research in developing and exploiting AI use in application areas, including resilient communications, smart manufacturing and robotics, building and energy controls management, and advanced materials discovery and design. As part of this work, NIST will also establish a national materials data network in collaboration with the NIST Advanced Materials Center of Excellence led by Northwestern University. In each of these AI application areas, NIST's unique expertise and capabilities (ranging from fundamental research and standards expertise to the technical foundations of emerging technologies) make it an asset in establishing and maintaining U.S. leadership in these areas.

[4] Mega Trends: Artificial Intelligence. Markets and Markets KnowledgeStore. Online: (subscription resource) https://www.marketsandmarkets.com/Knowledgestore.asp. Date accessed March 30, 2021.

Through these investments that build on NIST's current AI R&D portfolio, NIST will put the measurements, research and standards in place to drive economic growth and innovation using AI systems. The investments requested here would be complemented by NIST engagement and leadership in the standards development process - a key strategy to counter investments by foreign countries in AI that pose a serious threat to the competitiveness of U.S. firms and national security.

The request increases NIST's investment in its Advanced Communications, Networks, and Data Systems portfolio by $15.0 million.

Performance Measure: Number of partnerships with relevant academic, industry, and government partners for AI R&D, and associated contributions to AI standards development.

	2022	2023	2024	2025	2026
With increase	4	8	16	20	24
Without increase	1	2	3	4	5

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE PERSONNEL DETAIL

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Partnerships, Research, and Standards to Advance Trustworthy Artificial Intelligence

Full-time permanent					
Title		Grade	Number	Annual Salary	Total Salaries
Computer scientist		ZP IV	2	$122,530	$245,060
Computer scientist		ZP III	1	87,198	87,198
Statistician		ZP IV	1	122,530	122,530
Applied mathematician		ZP IV	1	122,530	122,530
ML-AI Advanced manufacturing specialist		ZP IV	1	122,530	122,530
ML-AI Industrial controls specialist		ZP IV	1	122,530	122,530
ML-AI Materials specialist		ZP III	2	87,198	174,396
ML-AI Materials specialist		ZP IV	2	122,530	245,060
ML-AI Resilient communications specialist		ZP IV	2	122,530	245,060
ML-AI Infrastructure specialist		ZP III	2	87,198	174,396
Administrative/technical support		ZA II	1	66,216	66,216
Total			16		1,727,506
Less lapse	25.00%		(4)		(431,877)
Total full-time permanent (FTE)			12		1,295,629
2022 pay Adjustment (2.7%)					34,982
					1,330,611
Personnel Data Summary					
Full-time Equivalent Employment (FTE)					
Full-time permanent			12		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total FTE			12		

Authorized Positions					
Full-time permanent			16		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total Positions			16		

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE DETAIL BY OBJECT CLASS
(Direct Obligations amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Partnerships, Research, and Standards to Advance Trustworthy Artificial Intelligence

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$256,282	$273,955	$279,340	$280,671	$1,331
11.3	Other than full-time permanent	20,408	21,285	21,703	21,703	0
11.5	Other personnel compensation	6,807	7,012	10,043	10,043	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	283,497	302,252	311,086	312,417	1,331
12.1	Civilian personnel benefits	93,447	99,683	114,356	114,787	431
13	Benefits for former personnel	27	27	27	27	0
21	Travel and transportation of persons	3,717	3,847	9,444	9,524	80
22	Transportation of things	982	1,038	1,059	1,081	22
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	119	113	143	143	0
23.2	Rental payments to others	2,009	2,049	2,090	2,090	0
23.3	Communications, utilities, and misc. charges	15,243	16,893	16,811	18,380	1,569
24	Printing and reproduction	344	426	435	467	32
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	1,866	1,759	1,611	1,611	0
25.2	Other services from non-Federal sources	42,845	57,504	31,510	32,768	1,258
25.3	Other goods and services from Federal sources	32,588	31,717	33,067	33,569	502
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	38,405	39,685	40,491	41,491	1,000
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	21,791	21,947	22,394	22,594	200
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	20,915	22,105	22,686	22,925	239
31	Equipment	41,353	42,004	42,901	43,737	836
32	Lands and structures	9	9	9	9	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	60,648	65,471	65,471	72,971	7,500
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	659,805	708,529	715,591	730,591	15,000

Department of Commerce
National Institute of Standards and Technology
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PROGRAM CHANGE FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Advanced Communications	Pos/BA	69	$24,930	96	$36,430	27	$11,500
Research and Standards	FTE/Obl.	69	24,930	89	36,430	20	11,500

Advanced Communications Research and Standards (+$11,500, +20 FTE/+27 Positions) - Secure, reliable, high-speed wireless communications are critical to the economic and national competitiveness of the U.S. advanced communications industry. They are enabling dramatic changes in how consumers, manufacturers, governments and others provide and consume information, transact business, provide and use essential services, and shop, among other tasks. As the Federal Government's leader in fundamental research, standards, and government-academia-industry coordination for advanced communications technologies, NIST requests $12 million to support the ever-growing research and standards needs of America's advanced communications industry, including public safety.

As the national metrology institute, NIST is uniquely positioned to develop the measurement tools and technologies that will improve spectrum utilization and enable novel spectrum sharing techniques. The budget request will allow NIST to provide industry with much-needed fundamental measurements and data needed for development of next-generation wireless communications systems and the improvement of optical communication technologies. NIST will conduct measurement science research and support the development of standards to accelerate the deployment of next-generation advanced communications technologies, including 5G and the Nationwide Public Safety Broadband Network, used to enhance public safety capabilities and to widely realize the promise of technologies for self-driving cars, internet of things (IoT) applications, and drones.

The requested funds will provide strong foundations of expertise for NIST to continue progress on enabling advances in mission critical voice, indoor location and tracking, security, analytics and next-generation user interfaces for public safety. NIST will initiate R&D programs to provide data for future spectrum auction decisions by developing new methodologies for measurements that include a hybrid of signals, and modeling to investigate not-yet-deployed systems, e.g. 6G, and beyond. NIST will support research in standards development and NIST-led stakeholder groups related to U.S. wireless supply chain innovation, working with stakeholder groups like the NIST 5G mmWave Channel Model Alliance and the NIST Industrial Wireless Technical Working Group. NIST will expand its standards coordination, participation, and information services for advanced communications. Through these strategic investments NIST will enhance U.S. influence in appropriate international standards development organizations such as ISO and 3GPP. The funds will enable NIST to continue and enhance its fierce advocacy efforts for U.S. industry in stakeholder groups related to supply chain innovation, and better leverage technical and collaborative expertise through the National Advanced Spectrum and Communications Test Network, a national network of federal, academic and commercial facilities to provide the testing, modeling and analyses for developing and deploying spectrum-sharing.

The request increases NIST's investment in its Advanced Communications, Networks, and Data Systems portfolio by $11.5 million.

Performance Measure: Number of measurement and modeling methodologies for a hybrid of radiated signals in wireless spectrums, and other associated contributions (e.g. workshops, datasets) to advanced communications standards development.

	2022	2023	2024	2025	2026
With increase	2	4	6	8	16
Without increase	1	2	2	2	3

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE PERSONNEL DETAIL

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Advanced Communications Research and Standards

Full-time permanent					
Title		Grade	Number	Annual Salary	Total Salaries
Spectrum researcher		ZP III	2	$87,198	$174,396
Spectrum researcher		ZP IV	2	122,530	245,060
Spectrum standards expert		ZP IV	2	122,530	245,060
Mission critical voice researcher		ZP IV	2	122,530	245,060
Location-based services researcher		ZP IV	2	122,530	245,060
Data analytics researcher		ZP IV	2	122,530	245,060
Next-Gen user interfaces researcher		ZP IV	2	122,530	245,060
Internet of things researcher		ZP IV	2	122,530	245,060
Modeling and simulation researcher		ZP IV	2	122,530	245,060
Hybrid signals researcher		ZP IV	2	122,530	245,060
5G researcher		ZP IV	2	122,530	245,060
Unmanned aerial vehicle researcher		ZP IV	1	122,530	122,530
Resilient systems researcher		ZP IV	1	122,530	122,530
Administrative/technical support		ZA II	3	66,216	198,648
Total			27		3,068,704
Less lapse	25.00%		(7)		(767,176)
Total full-time permanent (FTE)			20		2,301,528
2022 pay Adjustment (2.7%)					62,141
					2,363,669

Personnel Data Summary					
Full-time Equivalent Employment (FTE)					
Full-time permanent			20		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total FTE			20		
Authorized Positions					
Full-time permanent			27		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total Positions			27		

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE DETAIL BY OBJECT CLASS
(Direct Obligations amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Advanced Communications Research and Standards

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$256,282	$273,955	$279,340	$281,704	$2,364
11.3	Other than full-time permanent	20,408	21,285	21,703	21,703	0
11.5	Other personnel compensation	6,807	7,012	10,043	10,043	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	283,497	302,252	311,086	313,450	2,364
12.1	Civilian personnel benefits	93,447	99,683	114,356	115,122	766
13	Benefits for former personnel	27	27	27	27	0
21	Travel and transportation of persons	3,717	3,847	9,444	9,562	118
22	Transportation of things	982	1,038	1,059	1,115	56
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	119	113	143	143	0
23.2	Rental payments to others	2,009	2,049	2,090	2,090	0
23.3	Communications, utilities, and misc. charges	15,243	16,893	16,811	17,955	1,144
24	Printing and reproduction	344	426	435	474	39
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	1,866	1,759	1,611	1,613	2
25.2	Other services from non-Federal sources	42,845	57,504	31,510	32,461	951
25.3	Other goods and services from Federal sources	32,588	31,717	33,067	33,380	313
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	38,405	39,685	40,491	41,991	1,500
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	21,791	21,947	22,394	22,539	145
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	20,915	22,105	22,686	23,326	640
31	Equipment	41,353	42,004	42,901	44,963	2,062
32	Lands and structures	9	9	9	9	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	60,648	65,471	65,471	66,871	1,400
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	659,805	708,529	715,591	727,091	11,500

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Supporting the American Bioeconomy	Pos/BA	50	$20,500	77	$34,250	27	$13,750
	FTE/Obl.	50	20,500	70	34,250	20	13,750

Supporting the American Bioeconomy (+$13,750, +20 FTE/+27 Positions) - With the $13.75 million request, NIST will establish programs to develop measurements, data and standards for the U.S. bioeconomy. Supporting the bioeconomy is a fundamental part of NIST's mission to promote U.S. innovation and industrial competitiveness. This investment supports recent calls to action, including Executive Order 13987 "Organizing and Mobilizing the United States Government to Provide a Unified and Effective Response to Combat COVID-19 and To Provide United States Leadership on Global Health Security" and the 2020 National Academies "Safeguarding the Bioeconomy Report." NIST efforts with these funds will support public health through development and testing of rapid detection methods for infectious diseases and evaluation of vaccines and therapeutics that may reduce viral spread.

NIST researchers will also investigate the use of cells for biomanufacturing, potentially creating low-cost distributed advanced manufacturing methods. Funding will be split into three primary focus areas: developing capabilities for engineering biology, advancing biomanufacturing processes and technologies, and merging artificial intelligence (AI) with biological data to create new measurement technologies. This expansion of NIST programs will require the addition of technical experts in cell synthesis, bioengineering, biomanufacturing and AI. For state-of-the-art synthesis and characterization of biological systems, NIST will invest in equipment for nuclear magnetic resonance, mass spectrometry, and a computing cluster. NIST will ensure continued U.S. leadership, innovation, and competitiveness in the U.S. bioeconomy by providing measurements, standards, and fundamental research for the predictive engineering of complex biological systems, including design, build, test, and modeling of entire living cells, cell components or cellular systems. NIST will accelerate industry adoption of 21st century biomanufacturing technologies, developing rapid and comprehensive process controls needed to make the bioreactor production of therapeutics more flexible, timely, and cost-effective. AI investments will support the integration and convergence of engineering biology and biomanufacturing data streams to support U.S. biotechnology industry needs. These investments will enable the promotion of the U.S. bioeconomy and improve the Nation's ability to detect and mitigate increased biosecurity risks posed by dual-use and emerging biotechnologies.

The request increases each of NIST's investment its Advanced Manufacturing and Material Measurements, and Health and Biological Systems Measurements portfolios by about $7 million.

Performance measures: Number of well characterized datasets and measurements for the evaluation of the effectiveness of the application of AI techniques per year after the first year and provide measurements on new or existing standards each year, as well as continue the synthesis and understanding of cellular systems.

	2022	2023	2024	2025	2026
With increase	3	6	9	12	15
Without increase	1	2	4	6	8

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National Institute of Standards and Technology
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PROGRAM CHANGE PERSONNEL DETAIL

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Supporting the American Bioeconomy

Full-time permanent					
Title		Grade	Number	Annual Salary	Total Salaries
Computer Scientist		ZP IV	2	$122,530	$245,060
Physical Scientist		ZP IV	5	122,530	612,650
Data Scientist		ZP III	6	87,198	523,188
Physical Scientist		ZP III	11	87,198	959,178
Administrative/Technical Support		ZA II	3	66,216	198,648
Total			27		2,538,724
Less lapse	25.00%		(7)		(634,681)
Total full-time permanent (FTE)			20		1,904,043
2022 pay Adjustment (2.7%)					51,409
					1,955,452
Personnel Data Summary					
Full-time Equivalent Employment (FTE)					
Full-time permanent			20		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total FTE			20		
Authorized Positions					
Full-time permanent			27		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total Positions			27		

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE DETAIL BY OBJECT CLASS

(Direct Obligations amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Supporting the American Bioeconomy

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$256,282	$273,955	$279,340	$281,295	$1,955
11.3	Other than full-time permanent	20,408	21,285	21,703	21,703	0
11.5	Other personnel compensation	6,807	7,012	10,043	10,043	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	283,497	302,252	311,086	313,041	1,955
12.1	Civilian personnel benefits	93,447	99,683	114,356	114,990	634
13	Benefits for former personnel	27	27	27	27	0
21	Travel and transportation of persons	3,717	3,847	9,444	9,547	103
22	Transportation of things	982	1,038	1,059	1,111	52
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	119	113	143	143	0
23.2	Rental payments to others	2,009	2,049	2,090	2,090	0
23.3	Communications, utilities, and misc. charges	15,243	16,893	16,811	18,239	1,428
24	Printing and reproduction	344	426	435	466	31
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	1,866	1,759	1,611	1,611	0
25.2	Other services from non-Federal sources	42,845	57,504	31,510	32,559	1,049
25.3	Other goods and services from Federal sources	32,588	31,717	33,067	33,626	559
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	38,405	39,685	40,491	40,491	0
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	21,791	21,947	22,394	22,619	225
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	20,915	22,105	22,686	23,567	881
31	Equipment	41,353	42,004	42,901	46,927	4,026
32	Lands and structures	9	9	9	9	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	60,648	65,471	65,471	68,278	2,807
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	659,805	708,529	715,591	729,341	13,750

Department of Commerce
National Institute of Standards and Technology
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PROGRAM CHANGE FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Next-Generation Semiconductor	Pos/BA	57	$24,500	68	$34.500	11	$10,000
Metrology Research and Standards	FTE/Obl.	57	24,500	65	34,500	8	10,000

Next-Generation Semiconductor Research and Standards (+$10,000, +8 FTE/+11 Positions) – NIST requests $10.0 million to create measurement tools and testbeds to support the semiconductor and microelectronics technologies that will power industries of the future, such as artificial intelligence, autonomous vehicles, 5G, internet of things, and quantum computing. This investment supports objectives within Executive Order 14017 “America’s Supply Chains,” which aims to address risks in semiconductor manufacturing and advanced packaging supply chains, and the FY 2021 National Defense Authorization Act (NDAA) that included several provisions on the availability and growth of semiconductor technologies in the United States.

Advances in microelectronics by the semiconductor industry underpin U.S. economic strength, security, and technological standing. Moving forward, the nation that leads in microelectronics development will lead in defining and reaping the benefits from industries of the future. Global demand for semiconductors is forecasted to grow, with chip manufacturing capacity expected to grow 56 percent by 2030, while at the same time, U.S. leadership is at risk as other nations are quickly gaining ground by making significant investments in R&D and manufacturing. Over the past two decades, unprecedented innovation in microelectronics has resulted from radical changes in devices, materials, and system architectures. NIST has deep technical expertise in these areas, including nanoscale device characterization, microfabrication, 2D materials like graphene, and non-destructive measurement proficiency. NIST is a crucial partner in helping the U.S. microelectronics industry maintain its lead, including working in partnership with industry and academia through NIST’s nCORE partnership with the Semiconductor Research Corporation focused on nanoelectronic computing research.

With the requested funds, NIST will establish a new research program to characterize physical properties of complex material and processing interactions at the nanoscale -- needed to robustly and reliably manufacture future microelectronics. The program’s success in developing measurements and standards for new materials, devices, complex integration, and packaging will ensure timely breakthroughs that establish paths forward for continued innovation and early lab-to-fab adoption. These investments are critical for continued U.S. leadership in microelectronics manufacturing and a robust domestic supply chain. To increase core expertise and capabilities, NIST requests the addition of 8 FTEs in the fields of (but not limited to): materials science, chemistry, electrical engineering, and solid-state physics. Furthermore, $3 million of the requested investment will directly fund nanofabrication and advanced semiconductor characterization equipment modernization in Gaithersburg, Maryland and Boulder, Colorado. With the requested funds, NIST will increase the research capacity to explore new electronic materials, devices, and process-structure-function relationships that accelerate lab-to-fab implementation. NIST will develop metrological tools to robustly and reliably manufacture future microelectronic technologies.

The request increases NIST's investment its Advanced Manufacturing and Material Measurements portfolio by $10 million.

Performance measure: Number of robust and well-characterized metrological tools that characterize physical properties of complex material and processing interactions at the nanoscale and enhance U.S. ability to manufacture future microelectronic technologies.

	2022	2023	2024	2025	2026
With increase	3	6	8	16	24
Without increase	1	2	3	3	4

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE PERSONNEL DETAIL

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Next-Generation Semiconductor Metrology Research and Standards

Full-time permanent					
Title		Grade	Number	Annual Salary	Total Salaries
Supervisory Electrical Engineer		ZP V	1	$144,128	$144,128
Supervisory Physicist		ZP V	1	144,128	144,128
Chemist		ZP IV	2	122,530	245,060
Electrical Engineer		ZP IV	2	122,530	245,060
Materials Scientist		ZP IV	2	122,530	245,060
Physicist		ZP IV	2	122,530	245,060
Administrative/technical support		ZA II	1	66,216	66,216
Total			11		1,334,712
Less lapse	25.00%		(3)		(333,678)
Total full-time permanent (FTE)			8		1,001,034
2022 pay Adjustment (2.7%)					27,028
					1,028,062
Personnel Data Summary					
Full-time Equivalent Employment (FTE)					
Full-time permanent			8		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total FTE			8		

Authorized Positions					
Full-time permanent			11		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total Positions			11		

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National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE DETAIL BY OBJECT CLASS
(Direct Obligations amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Next-Generation Semiconductor Metrology Research and Standards

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$256,282	$273,955	$279,340	$280,368	$1,028
11.3	Other than full-time permanent	20,408	21,285	21,703	21,703	0
11.5	Other personnel compensation	6,807	7,012	10,043	10,043	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	283,497	302,252	311,086	312,114	1,028
12.1	Civilian personnel benefits	93,447	99,683	114,356	114,689	333
13	Benefits for former personnel	27	27	27	27	0
21	Travel and transportation of persons	3,717	3,847	9,444	9,509	65
22	Transportation of things	982	1,038	1,059	1,085	26
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	119	113	143	143	0
23.2	Rental payments to others	2,009	2,049	2,090	2,090	0
23.3	Communications, utilities, and misc. charges	15,243	16,893	16,811	17,871	1,060
24	Printing and reproduction	344	426	435	468	33
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	1,866	1,759	1,611	1,611	0
25.2	Other services from non-Federal sources	42,845	57,504	31,510	32,267	757
25.3	Other goods and services from Federal sources	32,588	31,717	33,067	33,233	166
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	38,405	39,685	40,491	40,491	0
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	21,791	21,947	22,394	22,620	226
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	20,915	22,105	22,686	23,485	799
31	Equipment	41,353	42,004	42,901	45,708	2,807
32	Lands and structures	9	9	9	9	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	60,648	65,471	65,471	68,171	2,700
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	659,805	708,529	715,591	725,591	10,000

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Measurements and Data to Enable the Circular Economy (CE)	Pos/BA	11	$8,500	20	$13,500	9	$5,000
	FTE/Obl.	11	8,500	18	13,500	7	5,000

Measurements and Data to Enable the Circular Economy (CE) (+$5,000, +7 FTE/+9 Positions) - NIST requests $5 million to create measurement technology and data tools to support efficient recovery, automated sorting (sortation), and complex recycling routes for plastics and other materials in our supply chains. The focal point of the investment ($4 million) is in polymer science, data, and measurements to improve identification and sorting technology for plastics through the use of machine learning, imaging, and calibrant/reference materials fabrication. This work is critical to improving sortation of plastics for better recycling rates, improving environmental assessments and methods to support selection tools such as life cycle assessments, developing data resources such as a data registry and reference data, and new scientific methods for polymer characterization to determine polymer properties and potential pathways during recycling and remanufacturing of plastics.

This investment will support a new research effort on measurements to support enhanced molecular design of plastics for improving end-of-use return of these materials to the supply chain. The requested funds will enable NIST to support cross-agency work on polymer innovation, environmental impact assessments, trade negotiations and the EPA's National Strategy to improve recovery of valuable materials from the waste stream. NIST will support robust stakeholder engagement with academia, industry, and government through roundtables and other workshops to refine understanding of challenges across the supply chain and address these challenges through committed partnerships with leading research institutions. This effort aligns strongly with the need to support a complex manufacturing base; it also complements and enables the linear economy to bend to circularity while improving understanding of climate and other environmental outcomes. NIST also requests $1 million to support further development of new programs for similar manufacturing and process needs in other classes of materials including electronics waste, battery and solar waste, and other waste streams (e.g., textiles or food waste). The request increases NIST's investment its Advanced Manufacturing and Material Measurements portfolio by $5 million.

Performance measure: Number of datasets available for training of machine learning algorithms, and evaluation of measurements and technology to support reference materials, calibrations and measurement validation in application areas including advanced polymeric materials, collection and sortation infrastructure, advanced recycling pathways, and environmental assessment of plastics waste.

	2022	2023	2024	2025	2026
With increase	2	4	8	16	32
Without increase	1	1	1	1	1

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE PERSONNEL DETAIL

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Measurements and Data to Enable the Circular Economy (CE)

Full-time permanent					
Title		Grade	Number	Annual Salary	Total Salaries
Physical Scientist		ZP IV	8	$122,530	$980,240
Administrative/Technical Support		ZA II	1	66,216	66,216
Total			9		1,046,456
Less lapse	25.00%		(2)		(261,614)
Total full-time permanent (FTE)			7		784,842
2022 pay Adjustment (2.7%)					21,191
					806,033
Personnel Data Summary					
Full-time Equivalent Employment (FTE)					
Full-time permanent			7		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total FTE			7		
Authorized Positions					
Full-time permanent			9		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total Positions			9		

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE DETAIL BY OBJECT CLASS
(Direct Obligations amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Measurements and Data to Enable the Circular Economy (CE)

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$256,282	$273,955	$279,340	$280,146	$806
11.3	Other than full-time permanent	20,408	21,285	21,703	21,703	0
11.5	Other personnel compensation	6,807	7,012	10,043	10,043	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	283,497	302,252	311,086	311,892	806
12.1	Civilian personnel benefits	93,447	99,683	114,356	114,617	261
13	Benefits for former personnel	27	27	27	27	0
21	Travel and transportation of persons	3,717	3,847	9,444	9,483	39
22	Transportation of things	982	1,038	1,059	1,080	21
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	119	113	143	143	0
23.2	Rental payments to others	2,009	2,049	2,090	2,090	0
23.3	Communications, utilities, and misc. charges	15,243	16,893	16,811	17,329	518
24	Printing and reproduction	344	426	435	449	14
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	1,866	1,759	1,611	1,611	0
25.2	Other services from non-Federal sources	42,845	57,504	31,510	31,899	389
25.3	Other goods and services from Federal sources	32,588	31,717	33,067	34,189	1,122
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	38,405	39,685	40,491	40,491	0
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	21,791	21,947	22,394	22,483	89
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	20,915	22,105	22,686	22,899	213
31	Equipment	41,353	42,004	42,901	44,429	1,528
32	Lands and structures	9	9	9	9	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	60,648	65,471	65,471	65,471	0
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	659,805	708,529	715,591	720,591	5,000

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Climate and Energy Measurements, Tools and Testbeds	Pos/BA	93	$36,843	130	$54,843	37	$18,000
	FTE/Obl.	93	36,843	121	54,843	28	18,000

Climate and Energy Measurements, Tools and Testbeds (+$18,000, +28 FTE/+37 Positions) - This request will position NIST to provide critical resources to the research community, industry, and other agencies to predict, measure, and manage aspects of the changing climate. The requested funds grow NIST expertise, adding to its cadre of scientists and engineers, increasing the research capabilities in the NIST Laboratories, and expanding public-private partnerships across the country. NIST laboratories generate the measurements and research to address climate change in impactful areas from climate measurements and modeling of greenhouse gas emissions, to research and tools to build more resilient communities and alternative energy infrastructure. Including funds requested under Standards Coordination and Special Programs (SCO-SPO), $7.5 million is for new efforts focused on building resiliently for the changing climate through research supporting building codes and standards resilient to future weather extremes, as well as focused programs addressing the challenge of heating and cooling low-energy buildings, advancing indoor air quality innovations, and solar cell and energy storage technologies for net-zero energy buildings; and $3.7 million will support smart grid innovations for clean energy and climate resilience, addressing key Smart Grid advancements to support widespread adoption of electric vehicles.

NIST will work with utility partners and other stakeholders on needed measurement methods and standards to assess whether grids are appropriately resilient in the face of climate change. The resources also support NIST's development of new electrical and timing measurements for advanced electricity meters and monitors for the electric grid. These will be needed as electricity is increasingly provided by solar and wind technologies and stored locally, and electric vehicles gain in use. Of the total request, $3.8 million will be applied to greenhouse gas measurements and standards for climate risk reduction. NIST's Urban Dome program will expand the Northeast Corridor Testbed with public and private partners to include more locations, accelerating the development of integrated models to provide emissions information at scales useful for city and state-level mitigation efforts. The funds will support efforts to advance the modeling of anthropogenic emissions and biogenic uptake and release in urban settings to improve the accuracy of mapping and authentication of Greenhouse Gas (GHG) emissions for cities and regions across the country. NIST will expand efforts in radiometric measurements, standards, and technology for use in miniature satellites (CubeSats) by developing new calibrations that ensure quality and accuracy of these satellite measurements, exploiting new chip-scale technologies to enable devices that are lower-cost and greater accuracy. Finally, the Nation will need to embrace new technologies to reduce the impact of carbon in the environment while improving our quality of life. NIST will use $5 million to expand efforts investigating different strategies for carbon capture and sequestration, including Direct Air Capture as well as other innovative concepts, and develop specialized neutron measurement capabilities for use by climate researchers across the Nation.

The request increases NIST's investment its Fundamental Measurement, Quantum Science, and Measurement Dissemination portfolio by $9.0 million, Physical Infrastructure and Resilience by $4.0 million, Advanced Manufacturing and Material Measurements by $3.0 million and User Facilities by $2 million.

Performance Measure: Number of new reports and innovative methods to cost-effectively ensure structural resilience of buildings and infrastructure informed by climate risk.

	2022	2023	2024	2025	2026
With increase	2	6	8	16	20
Without increase	1	2	3	3	3

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE PERSONNEL DETAIL

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Climate and Energy Measurements, Tools and Testbeds

Full-time permanent					
Title		Grade	Number	Annual Salary	Total Salaries
Computer scientist		ZP V	1	$144,128	$144,128
Computer scientist		ZP IV	2	122,530	245,060
Physicist		ZP IV	5	122,530	612,650
Electrical engineer		ZP IV	2	122,530	245,060
Physicist		ZP V	1	144,128	144,128
Electrical engineer		ZP III	2	87,198	174,396
Physical scientist		ZP III	3	87,198	261,594
Social scientist		ZP III	2	87,198	174,396
Economist		ZP IV	2	122,530	245,060
Mechanical engineer		ZP III	4	87,198	348,792
Mechanical engineer		ZP IV	3	122,530	367,590
Chemist		ZP IV	4	122,530	490,120
Chemist		ZP III	3	87,198	261,594
Technician		ZT III	1	66,216	66,216
Administrative specialist		ZA III	2	87,198	174,396
Administrative assistant		ZS III	1	44,237	44,237
Total			37		3,999,417
Less lapse	25.00%		(9)		(999,854)
Total full-time permanent (FTE)			28		2,999,563
2022 pay Adjustment (2.7%)					80,988
					3,080,551

Personnel Data Summary					
Full-time Equivalent Employment (FTE)					
Full-time permanent			28		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total FTE			28		
Authorized Positions					
Full-time permanent			37		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total Positions			37		

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE DETAIL BY OBJECT CLASS
(Direct Obligations amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Climate and Energy Measurements, Tools, and Testbeds

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$256,282	$273,955	$279,340	$282,421	$3,081
11.3	Other than full-time permanent	20,408	21,285	21,703	21,703	0
11.5	Other personnel compensation	6,807	7,012	10,043	10,043	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	283,497	302,252	311,086	314,167	3,081
12.1	Civilian personnel benefits	93,447	99,683	114,356	115,354	998
13	Benefits for former personnel	27	27	27	27	0
21	Travel and transportation of persons	3,717	3,847	9,444	9,598	154
22	Transportation of things	982	1,038	1,059	1,111	52
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	119	113	143	143	0
23.2	Rental payments to others	2,009	2,049	2,090	2,090	0
23.3	Communications, utilities, and misc. charges	15,243	16,893	16,811	18,740	1,929
24	Printing and reproduction	344	426	435	490	55
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	1,866	1,759	1,611	1,621	10
25.2	Other services from non-Federal sources	42,845	57,504	31,510	32,976	1,466
25.3	Other goods and services from Federal sources	32,588	31,717	33,067	33,707	640
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	38,405	39,685	40,491	41,691	1,200
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	21,791	21,947	22,394	22,638	244
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	20,915	22,105	22,686	23,221	535
31	Equipment	41,353	42,004	42,901	48,537	5,636
32	Lands and structures	9	9	9	9	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	60,648	65,471	65,471	67,471	2,000
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	659,805	708,529	715,591	733,591	18,000

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Strengthening Equity and Diversity in the Standards Workforce	Pos/BA	20	$11,480	32	$13,620	12	$2,140
	FTE/Obl.	20	11,480	29	13,620	9	2,140

Strengthening Equity and Diversity in the Standards Workforce (+$2,140, +9 FTE/+12 Positions) - NIST requests $2.140 million to build a diverse scientific workforce in the U.S. with skills and knowledge in measurements and standards for emerging technologies. This funding will initiate a new program to recruit postdoctoral researchers from underserved backgrounds to work in the NIST Laboratories. As the national metrology institute, NIST is the only federal agency qualified to create training programs targeting measurement science. These programs will support development of a diverse workforce and new pipelines for the next generation of innovative scientists and engineers, helping to improve diversity, inclusion, and equity in science, technology, engineering, and mathematics (STEM) careers. One of the main policy focuses of the current Administration is advancing racial equity and providing support for underserved groups, outlined in the *Executive Order on Advancing Racial Equity and Support for Underserved Communities Through the Federal Government* (EO 13985), which this initiative supports. Students in underserved groups have been found to innovate at higher rates, but their novel contributions are often discounted, and diverse and inclusive workplaces are better at retaining talent and are more innovative and productive.

Without initiatives that support career development and hiring pathways for diverse populations, the U.S. could unequivocally be missing out potential scientific expertise. The postdoctoral recruitment program will be similar to the well-regarded NIST NRC Postdoctoral Research Associateships Program with the National Academies that brings over 100 researchers of unusual promise and ability to NIST every year. However, the new program will allow NIST to seek out and select candidates from underserved groups, providing additional job opportunities for early career U.S. scientists and engineers to work at NIST, increasing diversity and equity in STEM fields, and bringing new innovative ideas to the U.S. R&D ecosystem.

The request increases NIST's investment its Exploratory Measurement Science portfolio by $2.1 million.

Performance measure: Number of postdoctoral fellows from underrepresented backgrounds hired for science and engineering careers at NIST.

	2022	2023	2024	2025	2026
With increase	12	12	12	12	12
Without increase	0	0	0	0	0

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE PERSONNEL DETAIL

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Strengthening Equity and Diversity in the Standards Workforce

Full-time permanent					
Title		Grade	Number	Annual Salary	Total Salaries
Postdoctoral fellow		ZP III	12	$87,198	$1,046,376
Total			12		1,046,376
Less lapse	25.00%		(3)		(261,594)
Total full-time permanent (FTE)			9		784,782
2022 pay Adjustment (2.7%)					21,189
					805,971
Personnel Data Summary					
Full-time Equivalent Employment (FTE)					
Full-time permanent			9		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total FTE			9		
Authorized Positions					
Full-time permanent			12		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total Positions			12		

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE DETAIL BY OBJECT CLASS
(Direct Obligations amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Laboratory Programs
Program Change: Strengthening Equity and Diversity in the Standards Workforce

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$256,282	$273,955	$279,340	$280,146	$806
11.3	Other than full-time permanent	20,408	21,285	21,703	21,703	0
11.5	Other personnel compensation	6,807	7,012	10,043	10,043	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	283,497	302,252	311,086	311,892	806
12.1	Civilian personnel benefits	93,447	99,683	114,356	114,617	261
13	Benefits for former personnel	27	27	27	27	0
21	Travel and transportation of persons	3,717	3,847	9,444	9,503	59
22	Transportation of things	982	1,038	1,059	1,079	20
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	119	113	143	143	0
23.2	Rental payments to others	2,009	2,049	2,090	2,090	0
23.3	Communications, utilities, and misc. charges	15,243	16,893	16,811	17,039	228
24	Printing and reproduction	344	426	435	447	12
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	1,866	1,759	1,611	1,611	0
25.2	Other services from non-Federal sources	42,845	57,504	31,510	31,748	238
25.3	Other goods and services from Federal sources	32,588	31,717	33,067	33,450	383
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	38,405	39,685	40,491	40,540	49
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	21,791	21,947	22,394	22,394	0
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	20,915	22,105	22,686	22,737	51
31	Equipment	41,353	42,004	42,901	42,934	33
32	Lands and structures	9	9	9	9	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	60,648	65,471	65,471	65,471	0
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	659,805	708,529	715,591	717,731	2,140

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM AND PERFORMANCE: DIRECT OBLIGATIONS
(Dollar amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Corporate Services

Line Item		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease over 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Corporate Services	Pos./Approp	36	$17,311	36	$17,460	36	$18,087	36	$18,087	0	0
	FTE/Obl.	33	17,312	34	17,462	34	18,087	34	18,087	0	0
Total	Pos./Approp	36	17,311	36	17,460	36	18,087	36	18,087	0	0
	FTE/Obl.	33	17,312	34	17,462	34	18,087	34	18,087	0	0

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
JUSTIFICATION OF PROGRAM AND PERFORMANCE
(Dollar amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Corporate Services

Goal Statement

The goal of the Corporate Services program is to support NIST's mission to deliver world-class measurement science, standards, and technology to our stakeholders in industry, academia, and government to drive technological innovation that strengthens the economic and industrial competitiveness of the United States and improves our quality of life.

Base Program

This program includes the NIST central information technology (IT) support for NIST's mission programs and operations providing secure, centrally managed IT infrastructure resources leading to improved measurement methods, standards advances, reference data, and research results benefiting numerous sectors of the U.S. economy. This program also provides the resources to operate and maintain administrative and financial management systems for NIST that satisfy the requirements established by the DOC, Office of Management and Budget, Government Accountability Office, Department of Treasury, and Congress.

Statement of Operating Objectives

In FY 2022, the Corporate Services will focus on the following items:

- Provide reliable, high-capacity networks to enable NIST laboratories and programs to meet mission-specific needs for large scale data transfer and analyses, disseminate NIST results to the public, and collaborate productively with NIST partners;
- Expand capabilities supporting high-throughput data capture and management;
- Refresh IT infrastructure equipment nearing end-of-life with modern, higher-capacity equipment; and
- Maintain and deliver reliable financial, acquisition, and administrative systems to assist NIST users in processing mission-related transactions, while striving to streamline business processes and improve transparency.

Explanation and Justification

Line Item		2020 Actual		2021 Enacted		2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Corporate Services	Pos./BA	36	$17,311	36	$17,460	36	$18,087
	FTE/Obl	33	17,312	34	17,462	34	18,087

Corporate Services (Total Funding: $18.1 million and 36 Positions)

Computer Support - This effort ensures that NIST's IT infrastructure advances at a pace consistent with the accelerating requirements associated with NIST's scientific and technical leadership. NIST maintains a Network Roadmap that defines a phased, prioritized approach for upgrading the network and maintaining performance consistent with NIST mission requirements. This roadmap addresses the following critical issues:

- Building a research network with the speed and capacity to transfer the volumes of data that NIST's mission requires to support American corporate leadership;
- Ensuring reliable network availability and support to Voice over IP; and
- Upgrading network and network security infrastructure so that NIST services can be migrated to cloud infrastructure.

Business Systems - The DOC is undertaking a major multi-year consolidation and modernization initiative of multiple business systems, functions, and processes and has entered into a long-term contract to implement a flexible system to support the management of financial, procurement, travel, grants, property, and other administrative functions called Business Applications Solution (BAS). NIST's business systems are an integral part of DOC's vision for consolidation and modernization. NIST has representatives participating in all facets of BAS's implementation (property, acquisitions, and core financial system). NIST supports DOC's effort to pursue a modernized Grants Management solution and continues to provide input to the DOC/Office of the Chief Information Officer's Grants Enterprise Management System effort. These efforts are undertaken while supporting NIST's current Commerce Business Systems.

The base funding requested of $18.1 million for Corporate Services supports the following ongoing mission functions and programmatic areas that are also described in more detail in the Laboratory Programs section of this budget request:

- Exploratory Measurement Science ($1.9 million)
- Advanced Manufacturing and Material Measurements ($3.2 million)
- Fundamental Measurement, Quantum Science, and Measurement Dissemination ($5.9 million)
- Advanced Communications, Networks, and Scientific Data Systems ($1.4 million)
- Cybersecurity and Privacy ($1.9 million)
- Health and Biological Systems and Measurements ($0.8 million)
- Physical Infrastructure and Resilience ($1.6 million)
- NIST User Facilities ($1.4 million)

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM AND PERFORMANCE: DIRECT OBLIGATIONS
(Dollar amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Standards Coordination and Special Programs *

Line Item		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease over 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Standards Coordination	Pos./Approp	195	$80,922	200	$83,401	200	$85,749	206	$91,502	6	$5,753
and Special Programs	FTE/Obl.	181	73,305	190	99,036	191	85,749	194	93,002	3	7,253
Total	Pos./Approp	195	80,922	200	83,401	200	85,749	206	91,502	6	5,753
	FTE/Obl.	181	73,305	190	99,036	191	85,749	194	93,002	3	7,253

* Includes Baldridge Performance Excellence Program (BPEP) funded at $2.2 million in FY 2020, $2.5M in FY 2021, and requested at $2.6M in FY 2022.

Department of Commerce
National Institute of Standards and Technology
Scientific Technical Research Services
JUSTIFICATION OF PROGRAM AND PERFORMANCE
(Dollar amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Standards Coordination and Special Programs

Goal Statement

The primary goal of the Standards Coordination and Special Programs is to provide for cross-cutting NIST functions in both the management of cross-cutting laboratory research projects, and NIST's engagement in standards policy, and documentary standards development.

Base Program

Standards Coordination and Special Programs houses cross-cutting NIST activities managed by the Associate Director for Laboratory Programs (ADLP) that deal with select R&D programs, documentary standards coordination, and policy development.

1. The Special Programs Office (SPO) was created to manage a selection of cross-cutting NIST research activities for the ADLP, enhancing management oversight, and resource coordination for high-profile programs that critically depend on the expertise and capabilities of two or more NIST laboratories. The Greenhouse Gas (GHG) Measurements program and the Forensic Science program are managed by the office.

    - The NIST GHG Measurements Program develops advanced tools and standards for accurately measuring GHG emissions so industries and governments will have the information they need to manage emissions effectively. The GHG program manages a series of test-beds to measure and monitor GHG emissions, and conducts research on multiple areas including advanced sensors for remote surveillance of gases, improved methods to reduce the error of measurements from smokestacks, and calibration of satellite sensors used to observe the impact changing environmental factors on the earth's climate.

    - The NIST Forensic Science Program is working to strengthen forensic practice through research and improved standards, conducting in several forensic disciplines, including DNA, ballistics, fingerprint analysis, trace evidence, and digital, among others. We provide physical reference standards and data that help forensic laboratories validate their analytical methods and ensure accurate test results. The program also supports CSAFE, a NIST Center of Excellence in Forensic Science, which is working to develop new statistical methods for use in evidence examination.

2. The Standards Coordination Office (SCO) advises NIST leadership on policy and strategy as they relate to NIST's statutory role and responsibilities in standardization and serves as a normative standards and conformity assessment related multi-functional resource for NIST and U.S. government staff. The primary work areas of the SCO are highlighted below.

    - Standards Coordination: Standards effectively expedite trade and stimulate economic growth when they are developed, maintained, and applied in accordance with national policy, processes, and procedures. NIST provides guidance, training, information, and assistance so that companies, government agencies, standards bodies, and others can successfully work together on essential standardization and conformity assessment activities.

    - Standards Policy: The U.S. government's role in the development and use of standards and conformity assessment is guided by the National Technology Transfer and Advancement Act of 1995 (P.L. 104-113), OMB Circular A-119, and other federal laws, regulations, and international agreements.

    - Standards and Trade and Regulation: NIST provides a range of resources and activities to help users navigate the complex U.S. and international standards landscape. NIST coordinates with the World Trade Organization, Technical Barriers to Trade Related Inquiry Point and Notification Authority, and Standards Information Center providing unique standards, conformity assessment and technical regulations related information to NIST staff, U.S. government employees, U.S. exporters, and foreign trading partners.

    - Conformity Assessment and Laboratory Accreditation: Standards expedite trade across borders only when agreed-upon standards are followed consistently. NIST fosters compliance by evaluating conformity assessment accreditation bodies and ensuring adherence to standards specified in international agreements. NIST operates the National Voluntary Laboratory Accreditation Program (NVLAP) for the U.S. by providing accreditation to testing and calibration laboratories based on evaluation of their technical qualifications and competence to perform certain types of tests in specified fields using internationally accepted guides and standards. NIST also designs and implements procedures for accrediting laboratories for their capability to provide calibrations traceable to national standards.

Examples of Accomplishments

Through its work in this activity and subactivity, NIST has delivered significant impact to stakeholders in the Federal Government and industry. Programs managed by the SPO and SCO have yielded significant impacts.

- Funding from the SPO's National Security Standards Program helped NIST researchers develop a series of tests to validate the performance of the Army Research Laboratory's next generation "Ballistic Witness Material", a material used to test the effectiveness of body armor in defeating the kinetic impact of a bullet.
- The National Institute of Standards and Technology (NIST) Forensic Science Research Program facilitated the development of the Firearms Process Map through a collaboration with OSAC's Firearms & Toolmarks Subcommittee and The Association of Firearm and Tool Mark Examiners (AFTE). The process mapping team worked together to capture and document the diverse practices of multiple laboratories. The map can benefit the firearm discipline by providing a behind-the-scenes perspective into the various components and complexities involved in

the firearms examination process. It can also be used to identify best practices, reduce errors, assist in training new examiners and highlight areas where further research or standardization would be beneficial.

- With the support of the forensic science program, NIST chemists worked with researchers at Auburn University to develop a safer and more flexible way to facilitate the training of dogs to identify hazardous materials like narcotics or explosives. The new method allows a special polymer that can absorb odors and release them slowly to be rapidly infused with the vapors of hazardous substances. Not only does this material eliminate the need for the dogs or their handlers to have any potential exposure to the acutely hazardous material, it greatly reduces sample preparation time which will speed the training cycle of the dogs. (https://www.nist.gov/news-events/news/2020/12/k9-chemistry-safer-way-train-detection-dogs)
- Researchers from the National Institute of Standards and Technology (NIST) and Kansas State University (KSU) used NIST's optical comb technology to simultaneously measure emissions of methane, ammonia, carbon dioxide and water vapor from the atmosphere around a beef cattle feedlot in Kansas. The NIST apparatus — a two-comb system — identifies trace gases based on the exact shades and amounts of infrared light absorbed by the atmosphere when the comb light is sent back and forth across open-air paths. https://advances.sciencemag.org/content/7/14/eabe9765
- As part of the NIST Standards Services Curricula Development Cooperative Agreement Program, NIST launched a new competition to fund cooperative agreements for curricula development that will educate students about the impact, nature and value of standards and standardization so they develop a strong understanding and appreciation for the role of standards in the domestic and global marketplace.
- NIST through the SCO is coordinating the federal partners to coordinate U.S. Government's (USG) engagement in key standard development areas including Artificial Intelligence and 5G Communications. The NIST SCO is working to support the National Security Council in the development of a Standards Calendar to track upcoming events that will be important for USG engagement.
- The SCO continues to provide support to U.S. Trade Representatives with respect to the important role of documentary standards in trade and has raised the profile of standards as key to national and economic security among key offices in the Executive Office of the President.
- The SCO, through laboratory accreditation and its role as the U.S. designating authority in international telecom equipment Mutual Recognition Agreements, has facilitated U.S. testing laboratories' capabilities in reducing market access burdens for U.S telecom equipment companies doing business globally. NIST's NVLAP conducted an evaluation of the asbestos proficiency testing program that supports the asbestos accreditation program. Improvements identified from NIST's assessment recommendations and refined analytical method will reduce test result uncertainty and improve the efficiency of laboratory testing in accredited laboratories. NVLAP currently oversees 19 active accreditation programs.

Many more interesting accomplishments and industry impacts can be found at: https://www.nist.gov/standardsgov/what-we-do/standardization-coordination and at https://www.nist.gov/spo.

Statement of Operating Objectives

Special Programs Office - The SPO will continue to foster communication and collaboration between NIST and external communities focused on critical national needs. To meet those needs, SPO works closely with and forges partnerships among government, military, academia, professional organizations, and private industry to provide world-class leadership in standards and technology innovation.

Standards Coordination Office - NIST's SCO plays a unique role in the Federal Government in coordinating federal standards activities with those of the private sector and as a resource to federal agencies and the private sector on the U.S. approach to standards and conformity. Thus, SCO is well positioned to support the Administration priorities addressing trade, technology, innovation, and competitiveness.

In support of the Administration's stated priorities on free, fair and reciprocal trade relations, SCO experts will contribute to, and support the Office of the U.S. Trade Representative (USTR) in their negotiation or re-negotiation of trade agreements through its expertise in administering the Technical Barriers to Trade Related Inquiry Point and Notification Authority to support negotiations on texts relating to Technical Barriers to Trade and Good Regulatory Practice. Furthermore, SCO staff will contribute to the negotiations on digital trade and telecommunications. Working with experts from other NIST laboratories, SCO experts will also support USTR negotiations that may be initiated to support a potential future U.S.-U.K. trade arrangement.

SCO will expand its efforts to support U.S. exporters by increasing awareness and use of export assistance tools such as Notify U.S., which enable interested stakeholders to learn about regulations being proposed by foreign countries that could impact exports to those markets. In addition to informing and raising awareness about potentially new technical barriers to trade, SCO also enables U.S. stakeholders to comment on these proposed foreign regulations.

SCO will continue its effort to raise awareness and improve information sharing relating to emerging standards issues among federal agencies. Such information sharing is a critical component of ensuring that agencies can understand and respond to developments in the U.S. and abroad that can impact U.S. competitiveness and innovation ability. Examples of efforts include work currently underway in collaboration with the Interagency International Cybersecurity Standardization Working Group to develop a strategy for federal agencies' engagement in standards to support cybersecurity for Internet of Things technologies and devices. The SCO is also supporting a number of efforts targeting artificial intelligence, and space commerce-related standards needs. These efforts also include a strong element of partnership with the U.S. private sector and particularly the U.S. standards system, coordinated by the American National Standards Institute (ANSI), which represents U.S. interests in standards developing bodies such as the International Organization for Standardization (ISO) and the International Electrotechnical Commission.

Baldrige Performance Excellence Program - Despite the tremendous progress toward self-sufficiency, funding is necessary to sustain and enhance the Baldrige Performance Excellence Program, a highly leveraged public-private partnership that defines, recognizes, and fosters excellence in manufacturing, service, small business, health care, education, and nonprofit organizations. NIST will use $2.5 million in funds to partner with industry to update the nationally recognized and globally emulated Baldrige Excellence Framework, a leadership and management guide and the standard of organization-wide excellence; to manage and improve the Baldrige Award process, which identifies role-model organizations and recognizes them with a Presidential award; to enhance outreach to foster national competitiveness through the use of the framework in business, healthcare, education, and nonprofits; and share the best practices and lessons learned of those role-model organizations. Funds will also support educational programs offered to leaders and senior executives; enable the continued non-financial support of the nationwide network of state and regional Baldrige-based programs, which exponentially expand the fostering of improvement and excellence among U.S. organizations; and the program's cybersecurity excellence initiative.

Explanation and Justification

Line Item		2020 Actual		2021 Enacted		2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Standards Coordination and Special Programs	Pos./BA	195	$80,922	200	$83,401	200	$85,749
	FTE/Obl	181	73,305	190	99,036	191	85,749

Standards Coordination and Special Programs (Total Funding: $85.8 million and 200 Positions)

The FY 2022 base request is $85.8 million. NIST's mission is inherently governmental. The Nation's founders knew the importance of weights and measures -- that it is critical to commerce and trade and a critical role of the Federal Government. Section 8 of the Constitution gives the government the power to "fix the Standard of Weight and Measures" and Congress established the National Bureau of Standards (renamed NIST in 1988) in 1901 to do just that. This role makes NIST a National Metrology Institute responsible for the dissemination of the fundamental units of measurement -- the basis of international trade and commerce, and scientific progress. NIST is commonly recognized as the best in the world at what it does as a National Metrology Institute. The research managed by the SPO depends upon the one-of-a-kind measurement expertise provided by the NIST laboratories to solve problems of national significance.

In the areas of documentary standards which is the purview of the SCO, NIST also has a unique role. The National Technology Transfer Advancement Act of 1995 (P.L. 104-113) and OMB Circular A-119 assign NIST the responsibility of coordinating Federal Government activities in the documentary standards development and conformity assessment procedures. NIST provides a forum for federal agency representatives to learn about standards and conformity assessment developments in the U.S. and abroad, share perspectives that can inform agency or USG positions on standards, and exchange current practices. By leading this Committee, NIST complements the coordination role provided by the American National Standards Institute (ANSI) for the private sector.

In addition, approximately 400 NIST technical staff from five of NIST's laboratories (with the exception of the user facilities) play a significant role in documentary standards development process by participating in almost 100 unique standards development organizations and contributing their technical skills and expertise in over 1,500 standards activities, including 100 standards-related leadership roles. Documentary standards development activities are effective means for disseminating NIST-developed technologies and measurement protocols since industry actively participates and rapidly adopts these standards.

The work supported by the Standards Coordination and Special Programs line item is primarily aligned with the NIST Laboratory work described in the Fundamental Measurement, Quantum Science, and Measurement Dissemination portfolio with an emphasis on measurement dissemination related activities.

The base funding request of $85.8 million for NIST's Standards Coordination and Special Programs supports the following ongoing mission functions and programmatic areas, which are also described in more detail in the Laboratory Programs section of this budget request:

- Fundamental Measurement, Quantum Science, and Measurement Dissemination ($60.9 million)
- Exploratory Measurement Science ($2.0 million)
- Advanced Manufacturing and Material Measurements ($13.0 million)
- Physical Infrastructure and Resilience ($5.0 million)
- Health and biological systems measurements ($2.1 million)
- Advanced Communications, Networks, and Scientific Data Systems ($0.3 million)

Additionally, this Activity/Subactivity funds the Baldrige Performance Excellence Program at $2.5 million.

In addition to this base request, NIST is requesting $5.7 million in initiative increases described in further detail below.

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Advanced Communications	Pos/BA	0	0	2	$500	2	$500
Research and Standards	FTE/Obl.	0	0	1	500	1	500

Advanced Communications Research and Standards (+$0.500, +1 FTE/+2 Positions) – This request increases funds for the Standards Coordination Office portion of the same initiative under Laboratory Programs. The funds requested is for $500 thousand for NIST to expand its standards coordination, participation, relevant to advanced communications.

The request increases NIST's investment in its Advanced Communications, Networks, and Scientific Data Systems portfolio by $500 thousand.

Performance Measure: Number of measurement and modeling methodologies for a hybrid of radiated signals in wireless spectrums, and other associated contributions (e.g. workshops, datasets) to advanced communications standards development.

	2022	2023	2024	2025	2026
With increase	2	4	6	8	16
Without increase	1	2	2	2	3

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE PERSONNEL DETAIL

Activity: Measurement Science, Services, and Programs
Subactivity: Standards Coordination and Special Programs
Program Change: Advanced Communications Research and Standards

Full-time permanent					
Title		Grade	Number	Annual Salary	Total Salaries
Standards coordination expert		ZP IV	1	$122,530	$122,530
Standards coordination expert		ZP III	1	87,198	87,198
Total			2		209,728
Less lapse	25.00%		(1)		(52,432)
Total full-time permanent (FTE)			1		157,296
2022 pay Adjustment (2.7%)					4,247
					161,543
Personnel Data Summary					
Full-time Equivalent Employment (FTE)					
Full-time permanent			1		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total FTE			1		
Authorized Positions					
Full-time permanent			2		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total Positions			2		

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE DETAIL BY OBJECT CLASS

(Direct Obligations amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Standards Coordination and Special Programs
Program Change: Advanced Communications Research and Standards

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$22,458	$23,418	$24,739	$24,901	$162
11.3	Other than full-time permanent	1,788	1,832	1,935	1,935	0
11.5	Other personnel compensation	597	607	641	641	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	24,843	25,857	27,315	27,477	162
12.1	Civilian personnel benefits	8,288	8,614	9,100	9,152	52
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	57	87	88	90	2
22	Transportation of things	60	72	73	73	0
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	0	0	3	3	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and misc. charges	1,974	2,144	2,157	2,210	53
24	Printing and reproduction	20	28	28	28	0
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	0	0	0	0	0
25.2	Other services from non-Federal sources	4,408	27,790	12,289	12,327	38
25.3	Other goods and services from Federal sources	2,685	2,884	3,010	3,018	8
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	3,164	3,164	3,199	3,268	69
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	1,796	1,809	1,829	1,836	7
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	3,666	3,719	3,776	3,782	6
31	Equipment	1,270	1,295	1,309	1,312	3
32	Lands and structures	0	0	0	0	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	21,073	21,573	21,573	21,673	100
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	1	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	73,305	99,036	85,749	86,249	500

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Supporting the American Bioeconomy	Pos/BA	0	0	0	$250	0	$250
	FTE/Obl.	0	0	0	250	0	250

Supporting the American Bioeconomy (+$0.250, +0 FTE/+0 Positions) - This request increases funds for the Standards Coordination Office portion of the same initiative under Laboratory Programs. The funds requested is for $250 thousand in grants to increase NIST's documentary standards efforts and engagement in areas pertinent to the growing bioeconomy.

The request increases NIST's investment its Advanced Manufacturing and Material Measurements, and Health and Biological Systems Measurements portfolios by $250 thousand.

Performance measures: Number of well characterized datasets and measurements for the evaluation of the effectiveness of the application of AI techniques per year after the first year and provide measurements on new or existing standards each year, as well as continue the synthesis and understanding of cellular systems.

	2022	2023	2024	2025	2026
With increase	3	6	9	12	15
Without increase	1	2	4	6	8

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE DETAIL BY OBJECT CLASS
(Direct Obligations amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Standards Coordination and Special Programs
Program Change: Supporting the American Bioeconomy

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$22,458	$23,418	$24,739	$24,739	0
11.3	Other than full-time permanent	1,788	1,832	1,935	1,935	0
11.5	Other personnel compensation	597	607	641	641	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	24,843	25,857	27,315	27,315	0
12.1	Civilian personnel benefits	8,288	8,614	9,100	9,100	0
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	57	87	88	89	$1
22	Transportation of things	60	72	73	73	0
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	0	0	3	3	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and misc. charges	1,974	2,144	2,157	2,183	26
24	Printing and reproduction	20	28	28	28	0
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	0	0	0	0	0
25.2	Other services from non-Federal sources	4,408	27,790	12,289	12,308	19
25.3	Other goods and services from Federal sources	2,685	2,884	3,010	3,014	4
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	3,164	3,164	3,199	3,199	0
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	1,796	1,809	1,829	1,832	3
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	3,666	3,719	3,776	3,779	3
31	Equipment	1,270	1,295	1,309	1,310	1
32	Lands and structures	0	0	0	0	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	21,073	21,573	21,573	21,766	193
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	1	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	73,305	99,036	85,749	85,999	250

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Climate and Energy Measurements, Tools and Testbeds	Pos/BA	6	$10,382	8	$12,382	2	$2,000
	FTE/Obl.	6	10,382	7	12,382	1	2,000

Climate and Energy Measurements, Tool and Testbeds (+$2,000, +1 FTE/+2 Positions) – This request increases funds for the Standards Coordination and Special Programs (SCO-SPO) portion of the same initiative under Laboratory Programs, including NIST's Urban Dome program expansion of the Northeast Corridor Testbed with public and private partners to include more locations, accelerating the development of integrated models to provide emissions information at scales useful for city and state-level mitigation efforts; funds will also support efforts to advance the modeling of anthropogenic emissions and biogenic uptake and release in urban settings to improve the accuracy of mapping and authentication of Greenhouse as (GHG) emissions for cities and regions across the country.

The request increases NIST's investment its Fundamental Measurement, Quantum Science, and Measurement Dissemination portfolio by $2.0 million.

Performance Measure: Number of new reports and innovative methods to cost-effectively ensure structural resilience of buildings and infrastructure informed by climate risk.

	2022	2023	2024	2025	2026
With increase	2	6	8	16	20
Without increase	1	2	3	3	3

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE PERSONNEL DETAIL

Activity: Measurement Science, Services, and Programs
Subactivity: Standards Coordination and Special Programs
Program Change: Climate and Energy Measurements, Tools and Testbeds

Full-time permanent					
Title		Grade	Number	Annual Salary	Total Salaries
Physical scientist		ZP III	1	$87,198	$87,198
Electrical engineer		ZP IV	1	122,530	122,530
Total			2		209,728
Less lapse	25.00%		(1)		(52,432)
Total full-time permanent (FTE)			1		157,296
2022 pay Adjustment (2.7%)					4,247
					161,543
Personnel Data Summary					
Full-time Equivalent Employment (FTE)					
Full-time permanent			1		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total FTE			1		
Authorized Positions					
Full-time permanent			2		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total Positions			2		

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE DETAIL BY OBJECT CLASS
(Direct Obligations amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Standards Coordination and Special Programs
Program Change: Climate and Energy Measurements, Tools and Testbeds

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$22,458	$23,418	$24,739	$24,901	$162
11.3	Other than full-time permanent	1,788	1,832	1,935	1,935	0
11.5	Other personnel compensation	597	607	641	641	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	24,843	25,857	27,315	27,477	162
12.1	Civilian personnel benefits	8,288	8,614	9,100	9,152	52
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	57	87	88	146	58
22	Transportation of things	60	72	73	103	30
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	0	0	3	3	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and misc. charges	1,974	2,144	2,157	2,370	213
24	Printing and reproduction	20	28	28	40	12
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	0	0	0	0	0
25.2	Other services from non-Federal sources	4,408	27,790	12,289	12,440	151
25.3	Other goods and services from Federal sources	2,685	2,884	3,010	3,113	103
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	3,164	3,164	3,199	3,699	500
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	1,796	1,809	1,829	1,856	27
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	3,666	3,719	3,776	3,896	120
31	Equipment	1,270	1,295	1,309	1,381	72
32	Lands and structures	0	0	0	0	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	21,073	21,573	21,573	22,073	500
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	1	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	73,305	99,036	85,749	87,749	2,000

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Strengthening Equity and Diversity in the Standards Workforce	Pos/BA	0	$0	2	$3,003	2	$3,003
	FTE/Obl.	0	0	1	3,003	1	3,003

Strengthening Equity and Diversity in the Standards Workforce (+$3,003, +1 FTE/+2 Positions) - This request increases funds for the Standards Coordination and Special Programs (SCO-SPO) portion of the same initiative under Laboratory Programs. NIST requests $3.003 million to build a diverse scientific workforce in the U.S. with skills and knowledge in measurements and standards for emerging technologies. With increasing global competition and heightened national security concerns, the U.S. must invest in the pipeline and nurture the talent required to maintain leadership in areas like quantum science, artificial intelligence, advanced communications, and cybersecurity. The requested funding will be used to develop an educational partnership program with minority-serving institutions (MSIs). As the national metrology institute, NIST is the only federal agency qualified to create training programs targeting measurement science.

These programs will support development of a diverse workforce and new pipelines for the next generation of innovative scientists and engineers, helping to improve diversity, inclusion, and equity in science, technology, engineering, and mathematics (STEM) careers. One of the main policy focuses of the current Administration is advancing racial equity and providing support for underserved groups, outlined in the *Executive Order on Advancing Racial Equity and Support for Underserved Communities Through the Federal Government* (EO 13985), which this initiative supports. Students in underserved groups have been found to innovate at higher rates, but their novel contributions are often discounted, and diverse and inclusive workplaces are better at retaining talent and are more innovative and productive. Without initiatives that support career development and hiring pathways for diverse populations, the U.S. could unequivocally be missing out. The partnership program with MSIs (including, for example, Historically Black Colleges and Universities, Hispanic-Serving Institutions, and Tribal Colleges and Universities) will provide grants to one or more minority-serving institutions to create a metrology training program and curriculum, creating new opportunities for underserved minorities and expanding an important talent pipeline for NIST and industry. By training students, these grants will help to develop the highly skilled workers needed and bring more diverse populations into STEM fields. Additionally, these grants will build awareness of metrology and stronger connections with NIST, potentially funneling new talent into NIST employment opportunities.

Performance measure: Number of cumulative students exposed to metrology training at minority-serving institutions.

	2022	2023	2024	2025	2026
With increase	48	96	144	192	240
Without increase	0	0	0	0	0

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE PERSONNEL DETAIL

Activity: Measurement Science, Services, and Programs
Subactivity: Standards Coordination and Special Programs
Program Change: Strengthening Equity and Diversity in the Standards Workforce

Full-time permanent					
Title		Grade	Number	Annual Salary	Total Salaries
Program manager		ZP III	1	$87,198	$87,198
Program administrative officer		ZA II	1	66,216	66,216
Total			2		153,414
Less lapse	25.00%		(1)		(38,354)
Total full-time permanent (FTE)			1		115,060
2022 pay Adjustment (2.7%)					3,107
					118,167
Personnel Data Summary					
Full-time Equivalent Employment (FTE)					
Full-time permanent			1		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total FTE			1		
Authorized Positions					
Full-time permanent			2		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total Positions			2		

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGE DETAIL BY OBJECT CLASS
(Direct Obligations amounts in thousands)

Activity: Measurement Science, Services, and Programs
Subactivity: Standards Coordination and Special Programs
Program Change: Strengthening Equity and Diversity in the Standards Workforce

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$22,458	$23,418	$24,739	$24,857	$118
11.3	Other than full-time permanent	1,788	1,832	1,935	1,935	0
11.5	Other personnel compensation	597	607	641	641	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	24,843	25,857	27,315	27,433	118
12.1	Civilian personnel benefits	8,288	8,614	9,100	9,138	38
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	57	87	88	102	14
22	Transportation of things	60	72	73	75	2
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	0	0	3	3	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and misc. charges	1,974	2,144	2,157	2,477	320
24	Printing and reproduction	20	28	28	31	3
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	0	0	0	0	0
25.2	Other services from non-Federal sources	4,408	27,790	12,289	12,635	346
25.3	Other goods and services from Federal sources	2,685	2,884	3,010	3,074	64
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	3,164	3,164	3,199	3,199	0
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	1,796	1,809	1,829	1,870	41
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	3,666	3,719	3,776	3,813	37
31	Equipment	1,270	1,295	1,309	1,329	20
32	Lands and structures	0	0	0	0	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	21,073	21,573	21,573	23,573	2000
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	1	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	73,305	99,036	85,749	88,752	3,003

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
SUMMARY OF REQUIREMENTS BY OBJECT CLASS
(Dollar amounts in thousands)

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11	Personnel compensation					
11.1	Full-time permanent	$283,393	$302,127	$309,104	$322,368	$13,264
11.3	Other than full-time permanent	22,566	23,495	24,038	24,038	0
11.5	Other personnel compensation	7,526	7,743	10,815	10,815	0
11.9	**Total personnel compensation**	313,485	333,365	343,957	357,221	13,264
12.1	Civilian personnel benefits	103,454	110,054	125,313	129,609	4,296
13	Benefits for former personnel	27	27	27	27	0
21	Travel and transportation of persons	3,807	3,967	9,565	10,367	802
22	Transportation of things	1,082	1,150	1,172	1,505	333
23.1	Rental payments to GSA	119	113	146	146	0
23.2	Rental payments to others	2,009	2,049	2,090	2,090	0
23.3	Communications, utilities, and miscellaneous charges	17,600	19,420	19,349	29,436	10,087
24	Printing and reproduction	383	473	482	750	268
25.1	Advisory and assistance services	1,866	1,759	1,611	1,623	12
25.2	Other services from non-Federal sources	48,892	86,934	45,437	57,304	11,867
25.3	Other goods and services from Federal sources	36,493	35,821	37,523	41,934	4,411
25.5	Research and development contracts	43,008	44,288	45,129	49,398	4,269
25.7	Operation and maintenance of equipment	24,402	24,571	25,038	26,591	1,553
26	Supplies and materials	24,785	26,028	26,669	31,339	4,670
31	Equipment	47,279	47,955	48,866	68,177	19,311
32	Land and structures	9	9	9	9	0
41	Grants, subsidies, and contributions	81,721	87,044	87,044	111,044	24,000
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	1	0	0	0	0
99	Total Obligations	750,422	825,027	819,427	918,570	99,143

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
99	Total Obligations	$750,422	$825,027	$819,427	$918,570	$99,143
	Less Prior Year Recoveries	(4,430)	0	0	0	0
	Less Prior Year Refunds	(41)	0	0	0	0
	Less prior year unobligated balance	(16,980)	(34,027)	0	0	0
	Plus Unobligated Balance, End of Year	34,027	0	0	0	0
	Plus Unobligated Balance, Expired	2	0	0	0	0
	Total Budget Authority	763,000	791,000	819,427	918,570	99,143
	Transfer to DoC Working Capital for HCHB renovation.					
	Transfer from Election Assistance Commission	(1,500)	(1,500)	0	(1,500)	(1,500)
	Transfers from DoJ for Office of Law Enforcement Standards	(1,500)	(1,500)	0	(1,500)	(1,500)
	Appropriation	760,000	788,000	819,427	915,570	96,143
	Personnel Data					
	Full-time Equivalent Employment:					
	Full-time permanent	2,158	2,281	2,292	2,413	121
	Other than full-time permanent	248	248	248	248	0
	Total	2,406	2,529	2,540	2,661	121
	Authorized Positions:					
	Full-time permanent	2,501	2,552	2,552	2,716	164
	Other than full-time permanent	85	85	85	85	0
	Total	2,586	2,637	2,637	2,801	164

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
Activity/Subactivity: Laboratory Programs
(Dollar amounts in thousands)

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11	Personnel compensation					
11.1	Full-time permanent	$256,282	$273,955	$279,340	$292,162	$12,822
11.3	Other than full-time permanent	20,408	21,285	21,703	21,703	0
11.5	Other personnel compensation	6,807	7,012	10,043	10,043	0
11.9	**Total personnel compensation**	283,497	302,252	311,086	323,908	12,822
12.1	Civilian personnel benefits	93,447	99,683	114,356	118,511	4,155
13	Benefits for former personnel	27	27	27	27	0
21	Travel and transportation of persons	3,717	3,847	9,444	10,171	727
22	Transportation of things	982	1,038	1,059	1,360	301
23.1	Rental payments to GSA	119	113	143	143	0
23.2	Rental payments to others	2,009	2,049	2,090	2,090	0
23.3	Communications, utilities, and miscellaneous charges	15,243	16,893	16,811	26,284	9,473
24	Printing and reproduction	344	426	435	688	253
25.1	Advisory and assistance services	1,866	1,759	1,611	1,623	12
25.2	Other services from non-Federal sources	42,845	57,504	31,510	41,323	9,813
25.3	Other goods and services from Federal sources	32,588	31,717	33,067	37,299	4,232
25.5	Research and development contracts	38,405	39,685	40,491	44,191	3,700
25.7	Operation and maintenance of equipment	21,791	21,947	22,394	23,869	1,475
26	Supplies and materials	20,915	22,105	22,686	27,190	4,504
31	Equipment	41,353	42,004	42,901	62,117	19,216
32	Land and structures	9	9	9	9	0
41	Grants, subsidies, and contributions	60,648	65,471	65,471	86,678	21,207
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
99	Total Obligations	659,805	708,529	715,591	807,481	91,890

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
99	Total Obligations	$659,805	$708,529	$715,591	$807,481	$91,890
	Less Prior Year Recoveries	(3,593)	0	0	0	0
	Less Prior Year Refunds	(41)	0	0	0	0
	Less prior year unobligated balance	(12,796)	(19,890)	0	0	0
	Plus Unobligated Balance, End of Year	19,890	0	0	0	0
	Plus Unobligated Balance, Expired	2	0	0	0	0
	Total Budget Authority	663,267	688,639	715,591	807,481	91,890
	Transfer to DoC Working Capital for HCHB renovation.					
	Transfer from Election Assistance Commission	(1,500)	(1,500)	0	(1,500)	(1,500)
	Transfers from DoJ for Office of Law Enforcement Standards	0	0	0	0	0
	Appropriation	661,767	687,139	715,591	805,981	90,390
	Personnel Data					
	Full-time Equivalent Employment:					
	Full-time permanent	1,966	2,079	2,089	2,207	118
	Other than full-time permanent	226	226	226	226	0
	Total	2,192	2,305	2,315	2,433	118
	Authorized Positions:					
	Full-time permanent	2,277	2,323	2,323	2,481	158
	Other than full-time permanent	78	78	78	78	0
	Total	2,355	2,401	2,401	2,559	158

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
Activity/Subactivity: Corporate Services
(Dollar amounts in thousands)

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11	Personnel compensation					
11.1	Full-time permanent	$4,653	$4,754	$5,025	$5,025	0
11.3	Other than full-time permanent	370	378	400	400	0
11.5	Other personnel compensation	122	124	131	131	0
11.9	**Total personnel compensation**	5,145	5,256	5,556	5,556	0
12.1	Civilian personnel benefits	1,719	1,757	1,857	1,857	0
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	33	33	33	33	0
22	Transportation of things	40	40	40	40	0
23.1	Rental payments to GSA	0	0	0	0	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and miscellaneous charges	383	383	381	381	0
24	Printing and reproduction	19	19	19	19	0
25.1	Advisory and assistance services	0	0	0	0	0
25.2	Other services from non-Federal sources	1,639	1,640	1,638	1,638	0
25.3	Other goods and services from Federal sources	1,220	1,220	1,446	1,446	0
25.5	Research and development contracts	1,439	1,439	1,439	1,439	0
25.7	Operation and maintenance of equipment	816	816	816	816	0
26	Supplies and materials	204	204	207	207	0
31	Equipment	4,656	4,656	4,656	4,656	0
32	Land and structures	0	0	0	0	0
41	Grants, subsidies, and contributions	0	0	0	0	0
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
99	Total Obligations	17,312	17,462	18,087	18,087	0

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decreas from 2022 Base
99	Total Obligations	$17,312	$17,462	$18,087	$18,087	0
	Less Prior Year Recoveries	(3)	0	0	0	0
	Less Prior Year Refunds	0	0	0	0	0
	Less prior year unobligated balance	0	(2)	0	0	0
	Plus Unobligated Balance, End of Year	2	0	0	0	0
	Total Budget Authority	17,311	17,460	18,087	18,087	0
	Transfer from Election Assistance Commission	0	0	0	0	0
	Transfers from DoJ for Office of Law Enforcement Standards	0	0	0	0	0
	Appropriation	17,311	17,460	18,087	18,087	0
	Personnel Data					
	Full-time Equivalent Employment:					
	Full-time permanent	30	31	31	31	0
	Other than full-time permanent	3	3	3	3	0
	Total	33	34	34	34	0
	Authorized Positions:					
	Full-time permanent	35	35	35	35	0
	Other than full-time permanent	1	1	1	1	0
	Total	36	36	36	36	0

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
Activity/Subactivity: Standards Coordination and Special Programs
(Dollar amounts in thousands)

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11	Personnel compensation					
11.1	Full-time permanent	$22,458	$23,418	$24,739	$25,181	$442
11.3	Other than full-time permanent	1,788	1,832	1,935	1,935	0
11.5	Other personnel compensation	597	607	641	641	0
11.9	**Total personnel compensation**	24,843	25,857	27,315	27,757	442
12.1	Civilian personnel benefits	8,288	8,614	9,100	9,241	141
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	57	87	88	163	75
22	Transportation of things	60	72	73	105	32
23.1	Rental payments to GSA	0	0	3	3	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and miscellaneous charges	1,974	2,144	2,157	2,771	614
24	Printing and reproduction	20	28	28	43	15
25.1	Advisory and assistance services	0	0	0	0	0
25.2	Other services from non-Federal sources	4,408	27,790	12,289	14,343	2,054
25.3	Other goods and services from Federal sources	2,685	2,884	3,010	3,189	179
25.5	Research and development contracts	3,164	3,164	3,199	3,768	569
25.7	Operation and maintenance of equipment	1,796	1,809	1,829	1,907	78
26	Supplies and materials	3,666	3,719	3,776	3,942	166
31	Equipment	1,270	1,295	1,309	1,404	95
32	Land and structures	0	0	0	0	0
41	Grants, subsidies, and contributions	21,073	21,573	21,573	24,366	2,793
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	1	0	0	0	0
99	Total Obligations	73,305	99,036	85,749	93,002	7,253

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
99	Total Obligations	$73,305	$99,036	$85,749	$93,002	$7,253
	Less Prior Year Recoveries	(834)	0	0	0	0
	Less Prior Year Refunds	0	0	0	0	0
	Less prior year unobligated balance	(4,184)	(14,135)	0	0	0
	Plus Unobligated Balance, End of Year	14,135	0	0	0	0
	Total Budget Authority	82,422	84,901	85,749	93,002	7,253
	Transfer from Election Assistance Commission	0	0	0	0	0
	Transfers from DoJ for Office of Law Enforcement Standards	(1,500)	(1,500)	0	(1,500)	(1,500)
	Appropriation	80,922	83,401	85,749	91,502	5,753
	Personnel Data					
	Full-time Equivalent Employment:					
	Full-time permanent	162	171	172	175	3
	Other than full-time permanent	19	19	19	19	0
	Total	181	190	191	194	3
	Authorized Positions:					
	Full-time permanent	189	194	194	200	6
	Other than full-time permanent	6	6	6	6	0
	Total	195	200	200	206	6

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
APPROPRIATION LANGUAGE AND CODE CITATIONS

1. For necessary expenses of the National Institute of Standards and Technology,

15 U.S.C. 272; 273; 278b-j; p
15 U.S.C. 290b-f
15 U.S.C. 1151-52
15 U.S.C. 1454(d-e)
15 U.S.C. 1511, 1512
15 U.S.C. 3710a-d
15 U.S.C. 3711a
15 U.S.C. 7301-7313
15 U.S.C. 7406
15 U.S.C. 7506(a)

15 U.S.C. 272; 273; 278b-j; provides basic authority for the performance of the functions and activities of the National Institute of Standards and Technology, authorizes appropriations for these purposes to be provided to the general public and specific institutions, governments, firms, and individuals, and requires the notification of Congress of a reprogramming of funds that exceeds a limit specified in public law.

15 U.S.C. 290b-f directs the Secretary of Commerce to provide for the collection, compilation, critical evaluation, publication, and dissemination of standard reference data and the authority to establish a non-agricultural technology office.

15 U.S.C. 1151-1152 establishes within the Department of Commerce, a central clearinghouse for technical information useful to American business and industry and provides for the dissemination of this technical, scientific information via the National Technical Information Service.

15 U.S.C. 1454(d-e) provides NIST with the authority to request that manufacturers and distributors of a commodity participate in voluntary product standards when there is undue proliferation of weights, measures, and quantities. Reports and recommendations to Congress are to be made upon industry failure to adopt these standards.

15 U.S.C. 1511, 1512 specifies that all bureaus of the Department of Commerce come under the authority of the Secretary of Commerce and that such bureaus including NIST shall be subject to the authority of the Secretary of Commerce.

15 U.S.C. 3710a-d provides the authority to enter into CRADAs, to make cash awards to scientific personnel for inventions, to retain royalties and to distribute royalties for inventions, and to communicate and coordinate for the Offices of Research and Technology Applications in Federal laboratories.

15 U.S.C. 3711a provides the authority for the Baldrige National Quality Award.

15 U.S.C. 7301-7313 establishes National Construction Safety Teams within NIST to respond to building and structural emergencies.

15 U.S.C. 7406 provides authority for NIST to conduct Cyber Security Research and Development to minimize security risks associated with computer systems used by the Federal government.

15 U.S.C. 7506(a) provides for the establishment of a nanotechnology research and development program within NIST.

P.L. 110-143 121 STAT 1809 provides NIST to assist in developing a research program to establish guidelines for the remediation of former methamphetamine laboratories in the United States as well as developing new detection technologies and appropriate Standard Reference Materials for methamphetamine detection testing.

2. For necessary expenses of NIST, $915,570,000, to remain available until expended, of which not to exceed $9,000,000 may be transferred to the "Working Capital Fund": *Provided*, That not to exceed $5,000 shall be for official reception and representation expenses: *Provided further*, That NIST may provide local transportation for summer undergraduate research fellowship program participants. (Department of Commerce Appropriations Act, 2021)

3. Public Law 110-69, America Competes Act, 121 Stat 572, passed August 9, 2007 reauthorizes the Scientific and Technical Research and Services appropriation through 2010. Public Law 111-358, America Competes Reauthorization Act, 2010, 124 Stat 3982, passed January 4, 2011 reauthorized the Scientific and Technical Research and Standards appropriation through 2013. In addition, an Emergency Communication and Tracking Technologies Research initiative and a Green Manufacturing and Construction initiative were authorized to develop advanced technologies in these areas.

4. Public Law 111-5, American Recovery and Reinvestment Act of 2009, made available funding to include $20,000,000 via transfer from the Department of Health and Human Services for continued work on advancing health care information enterprise integration.

5. Public Law 113-274 Cybersecurity Enhancement Act of 2014 amended Section 2c of the National Institute of Standards and Technology Act (15 U.S.C. 272(c) and established a Public-Private collaboration on Cybersecurity by designating the Director of the Institute activities that facilitate and support on an ongoing basis the development of a voluntary, consensus-based, industry-led set of standards, guidelines, best practices, methodologies, procedures, and processes to cost-effectively reduce cyber risks to the critical infrastructure of the United States.

6. Public Law 116-136, The Coronavirus Aid, Relief, and Economic Security Act, (CARES Act), as enacted March 27, 2020 made available funding, $6,000,000 for Scientific and Technical Research and Services "to remain available until September 30, 2021, to prevent, prepare for, and respond to coronavirus, domestically or internationally, by supporting continuity of operations, including measurement science to support viral testing and bio-manufacturing."

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
ADVISORY AND ASSISTANCE SERVICES
(Obligations in thousands of dollars)

	FY 2020 Actual	FY 2021 Enacted	FY 2022 Estimate
Consulting Services			
Management and professional support services	$610	$618	$503
Studies, analyses, and evaluations	1,231	1,116	1,095
Engineering and technical services	25	25	25
Total	1,866	1,759	1,623

Significant Activities

Advisory and assistance services funded by the STRS appropriation include the review and evaluation of the technical functions and operations of NIST by the Board on Assessment of the National Academy of Sciences. The evaluation panels consider the importance and relative priority of projects, quality of staff, equipment needs, and finances, and the relation of the programs to the mission of NIST.

Need for Advisory and Assistance Services

The need for advisory and assistance services stems from the NIST role in dealing with the private sector, professional organizations, and the public sector. Inputs must be obtained from consultants who can bring their individual expertise to bear and help NIST in assessing its program plans to meet the needs of its customers. The alternative to utilizing these services is to make no attempt to have expertise from sources outside NIST and risk degradation of the working and professional relationship with those in the business of using the products and services offered by NIST.

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Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
SUMMARY OF RESOURCE REQUIREMENTS
(Dollar amounts in thousands)

	Positions	FTE	Budget Authority	Direct Obligations	Appro-priation
Enacted Budget, 2021	99	96	$166,500	$175,026	$166,500
Less: Unobligated balance from prior year	0	0	0	(8,526)	0
2022 Adjustments to Base					
Plus: Inflationary adjustments to base	0	0	1,053	1,053	1,053
2022 Base	99	96	167,553	167,553	167,553
Plus: 2022 Program changes	63	47	274,097	274,097	274,097
2022 Estimate	162	143	441,650	441,650	441,650

Comparison by activity with totals by activity		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Technology Innovation Program	Pos./Approp	0	0	0	0	0	0	0	0	0	0
	FTE/Obl.	0	0	0	$66	0	0	0	0	0	0
Hollings Manufacturing Extension Partnership	Pos./Approp	81	$146,000	81	150,000	81	$150,860	139	$275,000	58	$124,140
	FTE/Obl.	78	147,206	80	157,346	80	150,860	123	275,000	43	124,140
Manufacturing USA	Pos/Approp	18	16,000	18	16,500	18	16,693	23	166,650	5	149,957
	FTE/Obl.	16	15,760	16	17,600	16	16,693	20	166,650	4	149,957
CARES Act (P.L. 116-136) - Hollings MEP	Pos/Approp	0	50,000	0	0	0	0	0	0	0	0
	FTE/Obl.	0	49,986	0	14	0	0	0	0	0	0
CARES Act (P.L. 116-136) - Manufacturing USA	Pos./Approp	0	10,000	0	0	0	0	0	0	0	0
	FTE/Obl.	0	10,000	0	0	0	0	0	0	0	0
TOTALS	Pos./Approp	99	222,000	99	166,500	99	167,553	162	441,650	63	274,097
	FTE/Obl.	94	222,952	96	175,026	96	167,553	143	441,650	47	274,097
Adjustments for											
Recoveries			(4,085)		0		0		0		0
Refunds			(31)		0		0		0		0
Unobligated balance, start of year			(5,362)		(8,526)		0		0		0
Unobligated balance, end of year			8,526		0		0		0		0
Budget Authority/Appropriation			222,000		166,500		167,553		441,650		274,097

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Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
ADJUSTMENTS TO BASE
(Dollar amounts in thousands)

	Perm. Pos.	FTE	Amount
Other Changes:			
Annualization of the FY 2021 pay raise	...	...	$40
FY 2022 pay increase and related costs	...	...	380
Changes in compensable days	...	...	0
Annualization of positions financed in FY 2021	...	...	...
Awards	...	...	(18)
Personnel benefits:			
Civil Service Retirement System (CSRS)	...	...	3
Federal Employees' Retirement System (FERS)	...	...	126
Thrift Savings Plan (TSP)	...	...	360
Federal Insurance Contribution Act (FICA) - OASDI	...	...	3
Health insurance	...	...	33
Employees' Compensation Fund	...	...	2
Travel and transportation of persons:			
Mileage	...	...	0
Per diem	...	...	0
Communications, utilities, and miscellaneous charges:			
Postage	...	...	0
Electricity rate	...	...	(8)
Natural gas rate	...	...	8
General pricing level adjustment	...	...	124
Total, Adjustments to base	0	0	1,053

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
PROGRAM AND PERFORMANCE: DIRECT OBLIGATIONS
(Dollar amounts in thousands)

Activity: Technology Innovation Program

Line Item		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Technology Innovation Program	Pos./Approp	0	0	0	0	0	0	0	0	0	0
	FTE/Obl.	0	0	0	$66	0	0	0	0	0	0

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
PROGRAM AND PERFORMANCE: DIRECT OBLIGATIONS
(Dollar amounts in thousands)

Activity: Hollings Manufacturing Extension Partnership

Line Item		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Hollings Manufacturing	Pos./Approp	81	$146,000	81	$150,000	81	$150,860	139	$275,000	58	$124,140
Extension Partnership	FTE/Obl.	78	147,206	80	157,346	80	150,860	123	275,000	43	124,140
CARES Act (P.L. 116-136)	Pos./Approp	0	$50,000	0	0	0	0	0	0	0	0
Hollings MEP	FTE/Obl.	0	49,986	0	14	0	0	0	0	0	0

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
JUSTIFICATION OF PROGRAM AND PERFORMANCE
(Dollar amounts in thousands)

Activity: Hollings Manufacturing Extension Partnership

Goal Statement

The Hollings Manufacturing Extension Partnership Program (MEP) is a national network of federal, State, and Industry partnerships that provide U.S. manufacturers with access to technology, resources, and industry experts. The MEP consists of Manufacturing Extension Partnership centers located across the country that work directly with their local manufacturing communities to strengthen the competitiveness of the U.S. manufacturing base. Funding for the MEP centers is a cost-sharing arrangement consisting of support from the Federal government, non-Federal sources including state and local government/entities, and fees charged to the manufacturing clients for services provided by the MEP centers.

Base Program

The MEP primarily aids small- and medium-sized U.S. manufacturers through 51 centers in every U.S. State and Puerto Rico, using a networked partnership approach to deliver services such as product and market development using tools and resources for improved processes and best practices, supply chain, growth services, and workforce development. NIST MEP also provides technical assistance in food safety best practices, accelerating the adoption of advanced manufacturing technologies, addressing emerging manufacturing needs, exporting and international business, advising on cybersecurity of supply chains, and transferring technology from NIST Laboratories and other federal research organizations. Last year MEP centers interacted with 27,574 manufacturers to perform its mission. Through the NIST MEP client impact survey, clients reported $13 billion in new and retained sales, $2.7 billion in cost savings, $4.9 billion in new capital investments, and helped create and retain more than 105,000 jobs.

In 1988, Congress passed the Omnibus Trade and Competitiveness Act of 1988 (P.L. 100-418) that created a program within NIST to assist U.S. manufacturing through cooperative efforts. The statute was amended in the America COMPETES Acts of 2007 and 2010 and MEP was reauthorized through the American Innovation and Competitiveness Act (P.L. 114-329), signed into law January 2017. For thirty years, MEP centers have acted as the go-to experts to promote business growth and connect manufacturers to public and private resources essential for increased competitiveness and profitability. Since 1988, MEP has worked with over 115,000 manufacturers, leading to $135 billion in new sales and $24.7 billion in cost savings and helped create and retain over 1.3 million jobs.

Statement of Operating Objectives

In FY 2020, MEP advanced the initiatives highlighted below:

- Supported 10,524 client firms, including nearly 1,930 rural and over 4,100 very small manufacturers (less than 20 employees). Of the 10,524 client firms, 1,630 or 15 percent were identified as participating in the DoD Supply Chain.
- Completed 1,775 workforce projects with manufacturers. Of the total 1,775 workforce projects, 430 (24 percent) were completed with rural manufacturers, and 1,134 (64 percent) were completed with manufacturers that have less than 100 employees.

- Continued the shift toward centers delivering to clients more innovation service projects such as digital manufacturing and advanced robotics. As of FY 2020, more than 1 in 5 projects are innovation related, including Growth Services, Technology Services, and Information Technology.
- Increased the share of smaller clients that receive MEP services. In FY 2020 over 58 percent of all completed projects were delivered to manufacturing clients with less than 50 employees.
- Worked with traditionally underserved populations including women-owned companies (11.5 percent of clients served) and minority-owned companies (5.2 percent of clients served).
- Continued providing cybersecurity awareness, training, and technical assistance to U.S. manufacturers nationwide, placing special emphasis on small defense contractors and implementation of adequate cybersecurity to protect controlled, unclassified information. MEP continued to execute partnerships with the Department of Defense, thereby, serving thousands of U.S. defense contractors in approximately three dozen states.
- Continued providing nationwide technical assistance to small U.S. food manufacturers relating to food safety practices and implementation of the Food Safety Modernization Act (FSMA) in particular. Under a Memorandum of Understanding (MOU) with the U.S. Food and Drug Administration, MEP centers are recognized across the U.S. as local resources for small food manufacturers to understand and implement safe food manufacturing practices.
- Assisted U.S. manufacturing supply chains across several industries with an emphasis on supply chain resilience. MEP Program Supplier Scouting services helped to identify U.S. manufacturers capable of producing critically needed supply chain items in short supply including personal protective equipment as well as other medical equipment and supplies.
- Developed and delivered technical assistance to small U.S. manufacturers nationwide relating to advanced manufacturing technology, with an emphasis on small manufacturer implementation of Industry 4.0. Technical assistance included implementation of digital manufacturing approaches, flexible automation/collaborative robotics, artificial intelligence, additive manufacturing, and smart manufacturing.
- Funded competitive projects for development of new manufacturing technologies of relevance to small- and mid-sized manufacturers, including MEP Center-led initiatives in Cybersecurity, Workforce Development, Advanced Manufacturing Technologies, and Industry 4.0.

Explanation and Justification

Line Item		2020 Actual		2021 Enacted		2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Hollings Manufacturing Extension Partnership	Pos./BA	81	$146,000	81	$150,000	81	$150,860
	FTE/Obl	78	147,206	80	157,346	80	150,860

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
PROGRAM CHANGE FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Hollings Manufacturing Extension Partnership Program	Pos/BA	81	$150,860	139	$275,000	58	$124,140
	FTE/Obl.	80	150,860	123	275,000	43	124,140

Hollings Manufacturing Extension Partnership Program (MEP) (+$124,140, 43 FTE/58 Positions) - The request will increase capabilities to be able to assist all growth oriented small- and medium-sized enterprises (SMEs) respond to critical national needs. The increased funding will strengthen operational excellence of the existing network, enabling a system-wide reinvigoration of services and capabilities through a formal, multi-year, organizational competition, and provide progressive growth in funding to serve all innovative manufacturing firms. The FY 2022 request provides additional services to an increased number of companies within critical supply chains and workforce development.

MEP will build on the National Network's current activities aimed at recruiting, retraining, and retaining the manufacturing workforce in the U.S. In partnership with local, state and other Federal programs, MEP Centers will identify initiatives for recruiting and retaining workers in the manufacturing sector to align with identified needs, priorities and strategies in states and localities as well as in industries and sectors. Additionally, MEP will promote a collaborative environment in which these partners will support the National Network, share best practices, and lead the execution of Center activities to recruit, retrain and retain manufacturing workers. With MEP Centers positioned as partners in critical workforce ecosystems throughout the U.S., MEP will lead by connecting local and national efforts to make manufacturers' workforces look more like our country in diversity, equity, and inclusion.

MEP will initiate a national supply chain initiative that will coordinate several critical functions with the goal to achieve resilient and secure supply chains. The MEP National Network will amplify its current practices to develop collaborative programs and to disseminate best practices to U.S. manufacturers.

MEP will create manufacturing technology demonstration workspaces to develop and deploy new services in key areas such as 3-D printing, Industry 4.0, flexible materials, and broadband technology that would be capable of positioning U.S.-based manufacturers to be more competitive in their supply chains.

Performance Measure:

	2022	2023	2024	2025	2026
Number of firms receiving in-depth technical assistance from MEP Centers					
With increase	13,000	14,200	14,900	15,500	16,000
Without increase	11,000	11,000	11,000	11,000	11,000
New or retained sales ($) in key product and critical technology supply chains					
With increase	$640M	$780M	$890M	$950M	$1,000M
Without increase	$400M	$400M	$400M	$400M	$400M

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
PROGRAM CHANGE PERSONNEL DETAIL

Activity: Hollings Manufacturing Extension Partnership
Program Change: Hollings Manufacturing Extension Partnership

Full-time permanent					
Title		Grade	Number	Annual	Total
Administrative & Financial Management Specialist		ZA V	1	$144,128	$144,128
Industrial Specialist		ZA V	2	144,128	288,256
IT Specialist		ZA V	1	144,128	144,128
Economist		ZP IV	1	122,530	122,530
General Business Specialist		ZA IV	1	122,530	122,530
General Engineer		ZP IV	1	122,530	122,530
Industrial Specialist		ZA IV	20	122,530	2,450,600
Information Specialist		ZA IV	1	122,530	122,530
IT Specialist		ZP IV	2	122,530	245,060
Physical Scientist		ZP IV	1	122,530	122,530
Administrative Officer		ZA III	2	87,198	174,396
General Business Specialist		ZA III	3	87,198	261,594
General Engineer		ZP III	1	87,198	87,198
Industrial Specialist		ZA III	3	87,198	261,594
Information Specialist		ZA III	2	87,198	174,396
Program Analyst		ZA III	1	87,198	87,198
Statistician		ZP III	1	87,198	87,198
Administrative Officer		ZA II	1	66,216	66,216
Administrative/Technical Support		ZA II	6	66,216	397,296
IT Specialist		ZA II	1	66,216	66,216
Secretary		ZS V	1	66,216	66,216
Administrative Support Assistant		ZS IV	4	54,440	217,760
Administrative Support Clerk		ZS II	1	35,470	35,470
Total			58		5,867,570

Less lapse	25.00%		(15)		($1,466,893)
Total full-time permanent (FTE)			43		4,400,677
2022 pay Adjustment (2.7%)					118,818
					4,519,495
Personnel Data Summary					
Full-time Equivalent Employment (FTE)					
Full-time permanent			43		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total FTE			43		
Authorized Positions					
Full-time permanent			58		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total Positions			58		

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
PROGRAM CHANGE DETAIL BY OBJECT CLASS

(Direct Obligations amounts in thousands)

Activity: Hollings Manufacturing Extension Partnership

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$9,842	$10,438	$10,676	$15,195	$4,519
11.3	Other than full-time permanent	733	756	773	773	0
11.5	Other personnel compensation	213	315	300	300	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	10,788	11,509	11,749	16,268	4,519
12.1	Civilian personnel benefits	3,523	3,913	4,436	5,900	1,464
13	Benefits for former personnel	1	1	1	1	0
21	Travel and transportation of persons	136	126	126	476	350
22	Transportation of things	5	5	5	209	204
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	4	0	0	0	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and misc. charges	715	408	409	4,580	4,171
24	Printing and reproduction	4	1	1	231	230
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	241	33	26	26	0
25.2	Other services from non-Federal sources	3,785	3,598	3,442	12,825	9,383
25.3	Other goods and services from Federal sources	1,820	1,776	1,792	2,421	629
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	0	0	0	0	0
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	402	366	373	1,122	749
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	111	84	85	957	872
31	Equipment	360	349	356	1,372	1,016
32	Lands and structures	0	0	0	0	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	175,297	135,191	128,059	228,612	100,553
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	197,192	157,360	150,860	275,000	124,140

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
PROGRAM AND PERFORMANCE: DIRECT OBLIGATIONS
(Dollar amounts in thousands)

Activity: Manufacturing USA

Line Item		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Manufacturing USA	Pos./Approp	18	$16,000	18	$16,500	18	$16,693	23	$166,650	5	$149,957
	FTE/Obl.	16	15,760	16	17,600	16	16,693	20	166,650	4	149,957
CARES Act (P.L. 116-136)	Pos./Approp	0	10,000	0	0	0	0	0	0	0	0
Manufacturing USA	FTE/Obl.	0	10,000	0	0	0	0	0	0	0	0

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
JUSTIFICATION OF PROGRAM AND PERFORMANCE
(Dollar amounts in thousands)

Activity: Manufacturing USA

Goal Statement

The primary goal of the Manufacturing USA program is to enable U.S. manufacturers to rapidly scale up discoveries to create advanced manufacturing products and processes, benefitting entire industry sectors to address national needs. Another major goal is workforce training in new and advanced technology, including helping veterans and disadvantaged communities to enter the manufacturing workforce and upskilling current workers for advanced technologies.

Base Program

The request provides funds for federal investment in the Manufacturing USA program which serves to increase U.S. global competitiveness by creation of an effective public-private manufacturing research infrastructure for U.S. industry and academia to solve industry-relevant problems. Manufacturing USA consists of industry-led institutes with federal startup funding plus matching non-federal funds over a 5 to 7-year period. The Institutes form a network for manufacturing innovation with common goals, but unique technical concentrations that can benefit an entire industry sector. Industry, academia, and government partners leverage existing resources, collaborate, and co-invest to nurture manufacturing innovation and accelerate commercialization. As an anchor for sustainable manufacturing innovation hubs, the Institutes create, showcase, and deploy new capabilities, new products, and new processes that an entire industry sector can use to improve commercial production. They build workforce skills at all levels and enhance manufacturing capabilities in companies (large and small). While the Institutes provide a network for stakeholders to leverage existing resources, collaborate, and co-invest, the development of commercial applications is left to the private sector, which now has tools (manufacturing processes) to make their products. The base request is $16.7 million in funds to continue program coordination and network support of Manufacturing USA institutes ($5.0 million, for the network currently standing at 16 institutes), grants to develop industrial technology roadmaps ($1.7 millions) and to continue the role of a DOC-sponsored institute ($10.0 million).

Program accomplishments and industry impact for the program can be found at: https://www.manufacturingusa.com/.

Statement of Operating Objectives

As part of efforts to revitalize U.S. manufacturing, Congress authorized (see Exhibit 33) a network of manufacturing innovation institutes where researchers, companies, universities, community colleges, and entrepreneurs come together to develop new manufacturing technologies with broad applications. These institutes also train the workforce, including returning veterans, needed to work in advanced manufacturing industries. The primary objective is to ensure that American innovations and inventions, currently going off-shore for production, would be scaled up from laboratory experiments to an industrial level in the U.S. by developing new manufacturing processes to be used by entire industry sectors. The program is designed to meet broad industry needs across sectors, with priority given to address national advanced manufacturing-related needs, such as artificial intelligence, cybersecurity, and quantum information.

Each Manufacturing USA Institute has a unique technology focus with the objective of creating robust regional manufacturing hubs that have national impact. The Institutes support an ecosystem of manufacturing activity in regions of the U.S., enabling redevelopment of domestic supply chains in areas of advanced technology. The Manufacturing USA Institutes support manufacturing technology commercialization by helping to bridge the gap from the laboratory to the market, and address core gaps in scaling U.S. manufacturing process technologies.

Explanation and Justification

Line Item		2020 Actual		2021 Enacted		2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Manufacturing USA	Pos./BA	18	$16,000	18	$16,500	18	$16,693
	FTE/Obl	16	15,760	16	17,600	16	16,693

The FY 2022 base funding is $16.7 million for the Manufacturing USA program: $5.0 million for coordination of the network of manufacturing institutes, $1.7 million for grants to develop industrial technology roadmaps, and $10.0 million to support the current DOC Manufacturing USA institute. With this base funding level NIST will be able to continue to support the continuation of the Department’s current DOC Manufacturing USA institute, the National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL).

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
PROGRAM CHANGE FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Manufacturing USA	Pos/BA	18	$16,693	23	$166,650	5	$149,957
	FTE/Obl.	16	16,693	20	166,650	4	149,957

Fund Two Additional DOC Manufacturing USA Institutes (+$149,957, +4 FTE/+5 Positions) – The request funds an additional two Manufacturing USA Institutes, one of which will help restore the United States as a leader in the design and manufacture of semiconductors. The request helps expand Manufacturing USA, which was created by Congress to strengthen U.S. manufacturing. Manufacturing USA promotes direct and broad collaboration on industry relevant research and development to make sure that innovations developed in the U.S. are also manufactured in the U.S. rather than other countries. Institutes will facilitate the adoption of new manufacturing technologies, tools, and methodologies that make U.S. manufacturers more competitive. Manufacturing USA efforts will emphasize outreach and engagement with small- and medium-sized manufacturing enterprises (SMEs), geographic regions of the country currently underrepresented in manufacturing, and underrepresented communities such as women and minorities. Institutes will provide shared state-of-the-art facilities for workforce training, including the education and training of returning veterans, individuals with disabilities and underrepresented minorities. Without the increased funding, the DOC will not be able to establish any additional industry-driven Innovation Institutes. These Institutes bridge a key market failure in the U.S. innovation ecosystem, which is even more pronounced in advanced manufacturing. U.S. manufacturers individually are challenged to fund these technological development functions, and small manufacturers especially struggle with individually investing in prototyping and scale-up of new technologies and products.

The $149.957 million increase, along with $16.693 million from base funds, allows the program to fund an additional two Manufacturing USA Institutes, one of which will help restore the United States as leader in the design and manufacture of semiconductors.

Performance Measure:

	2022	2023	2024	2025	2026
Number of DOC Mfg. USA Institutes with increase	3	3	3	3	3
Number of DOC Mfg. USA Institutes without increase	1	1	1	1	1

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
PROGRAM CHANGE PERSONNEL DETAIL

Activity: Manufacturing USA
Program Change: Fund Two Additional DOC Manufacturing USA Institutes

Full-time permanent					
Title		Grade	Number	Annual Salary	Total Salaries
Competition manager		ZP IV	1	$122,530	$122,530
Federal program officer		ZP V	1	144,128	144,128
Technical program officer		ZP V	2	144,128	288,256
Subject matter expert		ZP IV	1	122,530	122,530
Total			5		677,444
Less lapse	25.00%		(1)		(169,361)
Total full-time permanent (FTE)			4		508,083
2022 pay Adjustment (2.7%)					13,718
					521,801
Personnel Data Summary					
Full-time Equivalent Employment (FTE)					
Full-time permanent			4		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total FTE			4		
Authorized Positions					
Full-time permanent			5		
Part-time permanent			0		
Full-time temporary			0		
Part-time temporary			0		
Total Positions			5		

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
PROGRAM CHANGE DETAIL BY OBJECT CLASS

(Direct Obligations amounts in thousands)

Activity: Manufacturing USA
Program Change: Fund Two Additional DOC Manufacturing USA Institutes

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$2,221	$2,289	$2,342	$2,864	$522
11.3	Other than full-time permanent	183	189	193	193	0
11.5	Other personnel compensation	54	75	72	72	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	2,458	2,553	2,607	3,129	522
12.1	Civilian personnel benefits	788	850	965	1,134	169
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	27	25	25	138	113
22	Transportation of things	4	4	4	7	3
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	0	4	4	4	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and misc. charges	154	94	94	3040	2,946
24	Printing and reproduction	2	1	1	24	23
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	19	121	21	21	0
25.2	Other services from non-Federal sources	1,243	1,973	992	3,073	2,081
25.3	Other goods and services from Federal sources	220	218	219	692	473
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	4	4	4	4	0
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	134	129	131	507	376
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	37	34	35	324	289
31	Equipment	92	90	91	253	162
32	Lands and structures	0	0	0	0	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	20,578	11,500	11,500	154,300	142,800
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	25,760	17,600	16,693	166,650	149,957

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
SUMMARY OF REQUIREMENTS BY OBJECT CLASS
(Dollar amounts in thousands)

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11	Personnel compensation					
11.1	Full-time permanent	$12,063	$12,727	$13,018	$18,059	$5,041
11.3	Other than full-time permanent	916	945	966	966	0
11.5	Other personnel compensation	267	390	372	372	0
11.9	**Total personnel compensation**	13,246	14,062	14,356	19,397	5,041
12.1	Civilian personnel benefits	4,311	4,763	5,401	7,034	1,633
13	Benefits for former personnel	1	1	1	1	0
21	Travel and transportation of persons	163	151	151	614	463
22	Transportation of things	9	9	9	216	207
23.1	Rental payments to GSA	4	4	4	4	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and miscellaneous charges	869	502	503	7,620	7,117
24	Printing and reproduction	6	2	2	255	253
25.1	Advisory and assistance services	260	154	47	47	0
25.2	Other services from non-Federal sources	5,028	5,637	4,434	15,898	11,464
25.3	Other goods and services from Federal sources	2,040	1,994	2,011	3,113	1,102
25.5	Research and development contracts	4	4	4	4	0
25.7	Operation and maintenance of equipment	536	495	504	1,629	1,125
26	Supplies and materials	148	118	120	1,281	1,161
31	Equipment	452	439	447	1,625	1,178
32	Land and structures	0	0	0	0	0
41	Grants, subsidies, and contributions	195,875	146,691	139,559	382,912	243,353
43	Interest and dividends	0	0	0	0	0
99	Total Obligations	222,952 [1/]	175,026	167,553	441,650	274,097

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
99	Total Obligations	$222,952 [1/]	$175,026	$167,553	$441,650	$274,097
	Prior year recoveries	(4,085)	0		0	0
	Less prior year refunds	(31)	0	0	0	0
	Less prior year unobligated balance	(5,362)	(8,526)	0	0	0
	Plus unobligated balance end of year	8,526	0		0	0
	Total Budget Authority/Appropriation	222,000 [1/]	166,500	167,553	441,650	274,097
	Personnel Data					
	Full-time equivalent employment:					
	Full-time permanent	84	86	86	133	47
	Other than full-time permanent	10	10	10	10	0
	Total	94	96	96	143	47
	Authorized Positions:					
	Full-time permanent	89	89	89	152	63
	Other than full-time permanent	10	10	10	10	0
	Total	99	99	99	162	63

[1/] Includes supplemental CARES ACT obligations of $60M for COVID-19 related expenses.

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
Activity/Subactivity/Line Item: Hollings Manufacturing Extension Partnership
SELECT ACTIVITIES BY OBJECT CLASS
(Dollar amounts in thousands)

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11	Personnel compensation					
11.1	Full-time permanent	$9,842	$10,438	$10,676	$15,195	$4,519
11.3	Other than full-time permanent	733	756	773	773	0
11.5	Other personnel compensation	213	315	300	300	0
11.9	**Total personnel compensation**	10,788	11,509	11,749	16,268	4,519
12.1	Civilian personnel benefits	3,523	3,913	4,436	5,900	1,464
13	Benefits for former personnel	1	1	1	1	0
21	Travel and transportation of persons	136	126	126	476	350
22	Transportation of things	5	5	5	209	204
23.1	Rental payments to GSA	4	0	0	0	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and miscellaneous charges	715	408	409	4,580	4,171
24	Printing and reproduction	4	1	1	231	230
25.1	Advisory and assistance services	241	33	26	26	0
25.2	Other services from non-Federal sources	3,785	3,598	3,442	12,825	9,383
25.3	Other goods and services from Federal sources	1,820	1,776	1,792	2,421	629
25.5	Research and development contracts	0	0	0	0	0
25.7	Operation and maintenance of equipment	402	366	373	1,122	749
26	Supplies and materials	111	84	85	957	872
31	Equipment	360	349	356	1,372	1,016
32	Land and structures	0	0	0	0	0
41	Grants, subsidies, and contributions	175,297	135,191	128,059	228,612	100,553
43	Interest and dividends	0	0	0	0	0
99	Total Obligations	197,192 [1/]	157,360 [2/]	150,860	275,000	124,140

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
99	Total Obligations	$197,192 [1/]	$157,360	$150,860	$275,000	$124,140
	Less prior year recoveries	(3,941)	0	0	0	0
	Less prior year refunds	(3)	0	0	0	0
	Less prior year unobligated balance	(4,608)	(7,360) [2/]	0	0	0
	Plus unobligated balance end of year	7,360 [2/]	0	0	0	0
	Total Budget Authority/Appropriation	196,000 [1/]	150,000	150,860	275,000	124,140
	Personnel Data					
	Full-time equivalent employment:					
	Full-time permanent	70	72	72	115	43
	Other than full-time permanent	8	8	8	8	0
	Total	78	80	80	123	43
	Authorized Positions:					
	Full-time permanent	73	73	73	131	58
	Other than full-time permanent	8	8	8	8	0
	Total	81	81	81	139	58

[1/] Includes supplemental CARES ACT appropriation of $50M of which $49,986K obligated for COVID-19 related expenses.
[2] Includes supplemental CARES ACT obligations of $14K from FY 2020 unobligated balances for COVID-19 related expenses.

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
Activity/Subactivity/Line Item: Manufacturing USA
SELECT ACTIVITIES BY OBJECT CLASS
(Dollar amounts in thousands)

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11	Personnel compensation					
11.1	Full-time permanent	$2,221	$2,289	$2,342	$2,864	$522
11.3	Other than full-time permanent	183	189	193	193	0
11.5	Other personnel compensation	54	75	72	72	0
11.9	**Total personnel compensation**	2,458	2,553	2,607	3,129	522
12.1	Civilian personnel benefits	788	850	965	1,134	169
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	27	25	25	138	113
22	Transportation of things	4	4	4	7	3
23.1	Rental payments to GSA	0	4	4	4	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and miscellaneous charges	154	94	94	3,040	2,946
24	Printing and reproduction	2	1	1	24	23
25.1	Advisory and assistance services	19	121	21	21	0
25.2	Other services from non-Federal sources	1,243	1,973	992	3,073	2,081
25.3	Other goods and services from Federal sources	220	218	219	692	473
25.5	Research and development contracts	4	4	4	4	0
25.7	Operation and maintenance of equipment	134	129	131	507	376
26	Supplies and materials	37	34	35	324	289
31	Equipment	92	90	91	253	162
32	Land and structures	0	0	0	0	0
41	Grants, subsidies, and contributions	20,578	11,500	11,500	154,300	142,800
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
99	Total Obligations	25,760 [1/]	17,600	16,693	166,650	149,957

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
99	Total Obligations	$25,760 [1/]	$17,600	$16,693	$166,650	$149,957
	Less prior year recoveries	(144)	0	0	0	0
	Less prior year refunds	0	0	0	0	0
	Less prior year unobligated balance	(716)	(1,100)	0	0	0
	Plus unobligated balance end of year	1,100	0	0	0	0
	Total Budget Authority/Appropriation	26,000 [1/]	16,500	16,693	166,650	149,957
	Personnel Data					
	Full-time equivalent employment:					
	Full-time permanent	14	14	14	18	4
	Other than full-time permanent	2	2	2	2	0
	Total	16	16	16	20	4
	Authorized Positions:					
	Full-time permanent	16	16	16	21	5
	Other than full-time permanent	2	2	2	2	0
	Total	18	18	18	23	5

[1/] Includes supplemental CARES ACT appropriation of $10M of which $10M obligated for COVID-19 related expenses.

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
APPROPRIATION LANGUAGE AND CODE CITATIONS

1. For necessary expenses of the Industrial Technology Services appropriation of the National Institute of Standards and Technology,

15 U.S.C. 271 et seq.
15 U.S.C. 272(b)(1) and (b)(4)
15 U.S.C. 278b
15 U.S.C. 278k
15 U.S.C. 278l
15 U.S.C. 278n
15 U.S.C. 278r
15 U.S.C. 7506(a)(2)

15 U.S.C. 271 et seq. provides NIST's organic authorities.

15 U.S.C. 272(b)(1) authorizes the Secretary, through the Director of NIST, to assist industry in the development of technology and procedures needed to improve quality, to modernize manufacturing processes, to ensure product reliability, manufacturability, functionality, and cost-effectiveness, and to facilitate more rapid commercialization, especially by small- and medium-sized companies throughout the United States, of products based on new scientific discoveries in fields such as automation, electronics, advanced materials, biotechnology, and optical technologies.

15 U.S.C. 272(b)(4) authorizes the Secretary, through the Director of NIST, to enter into contracts, including cooperative research and development arrangements and grants and cooperative agreements, in furtherance of the purposes of the NIST Act.

15 U.S.C. 278b provides for a Working Capital Fund to support NIST activities.

15 U.S.C. 278k directs the Secretary, through the Director of NIST, to provide assistance for the creation of Regional Centers for the Transfer of Manufacturing Technology.

15 U.S.C. 278l provides authority for technical assistance to State technology programs.

15 U.S.C. 278n established the Advanced Technology Program within NIST to assist U.S. businesses in applying generic technology and research results to commercialize scientific discoveries and refine manufacturing technologies. Public Law 110-69 signed on August 9, 2007 has now abolished the Advanced Technology Program (ATP).

15 U.S.C. 7506(a)(2) instructs the NIST Director to utilize the Manufacturing Extension Partnership program to the extent possible to ensure that basic research on issues related to the development and manufacture of nanotechnology, including metrology; reliability and quality assurance; processes control; and manufacturing best practices reaches small- and medium-sized manufacturing companies.

2. For necessary expenses for industrial technology services, $441,650,000, to remain available until expended, of which $275,000,000 shall be for the Hollings Manufacturing Extension Partnership, and of which $166,650,000 shall be for the Manufacturing USA Program (formerly known as the National Network for Manufacturing Innovation). (Department of Commerce Appropriations Act, 2021)

3. Public Law 110-69, America Competes Act, 121 Stat 572, enacted August 9, 2007 reauthorized the Industrial Technology Services appropriation through 2010. In addition, it eliminated the Advanced Technology Program (ATP) and established the Technology Innovation Program (TIP) which provides grants to eligible companies or joint ventures whose proposed technology has strong potential to address critical national needs. It also amended 15 U.S.C. 3711 by changing the name of the National Medal of Technology from “Technology Medal” to “Technology and Innovation Medal”.

4. Public Law 111-358, America Competes Reauthorization Act, 2010, 124 Stat 3982, enacted January 4, 2011 reauthorized the Industrial Technology Services appropriation through 2013 to include the Manufacturing Extension Partnership Program (MEP) and the Malcolm Baldrige National Quality Award program. In addition, authorization is provided for an Innovative Services Initiative to assist small and medium-sized manufacturers within the MEP program.

5 Public Law 112-55, Consolidated and Further Continuing Appropriations Act, 2012, 125 Stat 552, enacted November 18, 2011 did not contain funding for the Technology Innovation Program (TIP) and the Baldrige Performance Excellence Program (BPEP).

6. Public Law 113-235, Consolidated and Further Continuing Appropriations Act, 2015, 128 Stat 2130, enacted December 16, 2014 amends 15 U.S.C. 271 et seq by establishing the Network for Manufacturing Innovation Program within the Industrial Technology Services appropriation to facilitate access to capital-intensive infrastructure in order to transition innovative technologies into scalable, cost-effective, and high-performing manufacturing capabilities thereby stimulating U.S. leadership in advanced manufacturing research, innovation, and technology. As part of the program, the Secretary shall establish a network of centers for manufacturing innovation. Funding for the program is as follows: “to the extent provided for in advance by appropriations Acts the Secretary may use not to exceed $5,000,000 for each of the fiscal years 2015 through 2024 to carry out this section from amounts appropriated to the Institute for Industrial Technical Services” and, “to the extent provided for in advance by appropriations Acts, the Secretary of Energy may transfer to the Institute not to exceed $250,000,000 for the period encompassing fiscal years 2015 through 2024 from amounts appropriated for advanced manufacturing research and development within the Energy Efficiency and Renewable Energy account for the Department of Energy.”

7. Public Law 114-113, Consolidated Appropriations Act, 2016, enacted on December 18, 2015 did not contain funding for the Advanced Manufacturing Technology Consortia. The accompanying Explanatory Statement contained language which moved the program into the National Network for Manufacturing Innovation as follows: “The agreement also merges the activities of the Advanced Manufacturing Technology Consortia (AMTech) into NNMI (National Network for Manufacturing Innovation).”

8. Public Law 116-136, The Coronavirus Aid, Relief, and Economic Security Act, (CARES Act), as enacted March 27, 2020 made available funding, $60,000,000 for Industrial Technology Services, “to remain available until September 30, 2021, to prevent, prepare for, and respond to coronavirus, domestically or internationally: *Provided,* That of the amount provided under this heading in this Act, $50,000,000 shall be for the Hollings Manufacturing Extension Partnership to assist manufacturers to prevent, prepare for, and respond to coronavirus and $10,000,000 shall be for the National Network for Manufacturing Innovation (also known as “Manufacturing USA”) to prevent, prepare for, and respond to coronavirus, including to support development and manufacturing of medical counter-measures and biomedical equipment and supplies.”

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
ADVISORY AND ASSISTANCE SERVICES
(Obligations in thousands of dollars)

	FY 2020 Actual	FY 2021 Enacted	FY 2022 Estimate
Consulting Services			
Management and professional support services	$250	$146	$46
Studies, analyses, and evaluations	10	8	1
Engineering and technical services	0	0	0
Total	260	154	47

Significant Activities
Advisory and assistance services funded by the Industrial Technology Services appropriation are used to conduct evaluations of the programmatic outcomes, service delivery efficiency, and internal infrastructure requirements of the MEP Program.

Need for Advisory and Assistance Services
The need for advisory and assistance services stems from the role of NIST's extramural programs with its outside partners and small businesses to relate to the private sector, professional organizations, and the public sector. Inputs must be obtained from consultants who can bring their individual expertise to bear and help NIST in assessing its program plans to meet the needs of its customers. The alternative to utilizing these services is to make no attempt to have expertise from sources outside NIST and risk having a poorer working and professional relationship with those in the business of using the products and services offered by NIST. These services provide for economic assessment and external evaluation of NIST's extramural programs.

Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
SUMMARY OF RESOURCE REQUIREMENTS
(Dollar amounts in thousands)

	Positions	FTE	Budget Authority	Direct Obligations	Appro-priation
Enacted, 2021	116	110	$80,000	$309,748	$80,000
Less: Unobligated balance from prior year	0	0	0	(229,748)	0
2022 Adjustments to Base					
Plus: Inflationary adjustments to base	0	0	2,000	2,000	2,000
2022 Base	116	110	82,000	82,000	82,000
Plus: 2022 Program changes	0	0	58,000	58,000	58,000
2022 Estimate	116	110	140,000	140,000	140,000

Comparison by activity/subactivity with totals by activity		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Construction and Major Renovations											
Construction and Major	Pos/Approp	116	$118,000	116	$80,000	116	$82,000	116	$140,000	0	$58,000
Renovations	FTE/Obl.	111	142,897	110	309,748	110	82,000	110	140,000	0	58,000
Adjustments for											
Recoveries			(654)		0		0		0		0
Refunds			(12)		0		0		0		0
Unobligated balance, start of year			(253,979)		(229,748)		0		0		0
Unobligated balance, end of year			229,748		0		0		0		0
Budget Authority/Appropriation			118,000		80,000		82,000		140,000		58,000

Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
PROGRAM AND PERFORMANCE: REIMBURSABLE OBLIGATIONS
(Dollar amounts in thousands)

Comparison by activity/subactivity		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Construction and Major Renovations											
Safety, Capacity, Maintenance and	Pos/Approp	0	0	0	0	0	0	0	0	0	0
Major Repairs	FTE/Obl.	0	$778	0	$885	0	0	0	0	0	0

Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
SUMMARY OF FINANCING
(Dollar amounts in thousands)

	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
Total Obligations	$143,675	$310,633	$82,000	$140,000	$58,000
Offsetting collections from:					
Non-Federal sources	(885)	0	0	0	0
Total offsetting collections	(885)	0	0	0	0
Recoveries (Direct)	(654)	0	0	0	0
Refunds (Direct)	(12)	0	0	0	0
Unobligated balance, start of year (Direct)	(253,979)	(229,748)	0	0	0
Unobligated balance, start of year (Reimbursable)	(778)	(885)	0	0	0
Unobligated balance, end of year (Direct)	229,748	0	0	0	0
Unobligated balance, end of year (Reimbursable)	885	0	0	0	0
Budget Authority/Appropriation	118,000	80,000	82,000	140,000	58,000

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Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
ADJUSTMENTS TO BASE
(Dollar amounts in thousands)

	Perm. Pos.	FTE	Amount
Other Changes:			
Annualization of FY 2021 Pay Raise	...	...	$34
FY 2022 pay increase and related costs	...	...	302
Changes in compensable days	...	...	0
Annualization of positions financed in FY 2021	0	0	
Awards	...	...	11
Personnel benefits:			
Civil Service Retirement System (CSRS)	...	...	3
Federal Employees' Retirement System (FERS)	...	...	100
Thrift Savings Plan (TSP)	...	...	291
Federal Insurance Contribution Act (FICA) - OASDI	...	...	2
Health insurance	...	...	27
Employees' Compensation Fund	...	...	3
Travel and transportation of persons:			
Mileage	...	...	0
Per diem	...	...	0
Communications, utilities, and miscellaneous charges:			
Postage	...	...	0
Electricity rate	...	...	(1)
Natural gas rate	...	...	1
General pricing level adjustment	...	...	1,227
Total, adjustments to base	0	0	2,000

Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
PROGRAM AND PERFORMANCE: DIRECT OBLIGATIONS
(Dollar amounts in thousands)

Activity: Construction and Major Renovations

Line Item		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Construction and Major Renovations	Pos/Approp	8	$43,000	0	$6,095	0	$6,095	0	0	0	($6,095)
	FTE/Obl.	6	73,575	0	151,600	0	6,095	0	0	0	(6,095)
Safety, Capacity, Maintenance and Major Repairs	Pos/Approp	108	75,000	116	73,905	116	75,905	116	$140,000	0	64,095
	FTE/Obl.	105	69,322	110	157,274	110	75,905	110	140,000	0	64,095
External Projects	Pos/Approp	0	0	0	0	0	0	0	0	0	0
	FTE/Obl.	0	0	0	874	0	0	0	0	0	0
Total	Pos/Approp	116	118,000	116	80,000	116	82,000	116	140,000	0	58,000
	FTE/Obl.	111	142,897	110	309,748	110	82,000	110	140,000	0	58,000

Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
PROGRAM AND PERFORMANCE: REIMBURSABLE OBLIGATIONS
(Dollar amounts in thousands)

Activity: Construction and Major Renovations

Comparison by activity/subactivity		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Construction and Major Renovations	Pos/Approp	0	0	0	0	0	0	0	0	0	0
	FTE/Obl.	0	0	0	0	0	0	0	0	0	0
Safety, Capacity, Maintenance and	Pos/Approp	0	0	0	0	0	0	0	0	0	0
Major Repairs	FTE/Obl.	0	$778	0	$885	0	0	0	0	0	0
External Projects	Pos/Approp	0	0	0	0	0	0	0	0	0	0
	FTE/Obl.	0	0	0	0	0	0	0	0	0	0
Total	Pos/Approp	0	0	0	0	0	0	0	0	0	0
	FTE/Obl.	0	778	0	885	0	0	0	0	0	0

Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
JUSTIFICATION OF PROGRAM AND PERFORMANCE
(Dollar amounts in thousands)

Activity: Construction and Major Renovations

Goal Statement

The goal of Construction of Research Facilities (CRF) funding is to provide the facilities and infrastructure that enable scientists and researchers to fulfill NIST's mission – "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."

Base Program

The CRF appropriation funds construction activities, including maintenance, repairs, improvements, and major renovations of facilities occupied or used by NIST in Gaithersburg, Maryland; Boulder and Fort Collins, Colorado; and Kauai, Hawaii with the intent to meet current and future advancements in measurement science, standards, and technology to promote innovation and industrial competitiveness for the Nation.

In the 1950s and 1960s, the U.S. government recognized the need to invest in science and technology and built state-of-the-art scientific facilities to support the research mission of NIST (then the National Bureau of Standards). More than half a century later, the aging and deteriorating buildings and infrastructure threaten NIST's ability to meet its mission. While the construction of new facilities and major renovation of existing facilities in recent years have made some improvements in the overall facility projects for each campus, the current overall state of facilities and infrastructure continues to be a serious impediment to NIST's ability to conduct advanced measurement science and research. This is primarily due to the unique funding requirements of major construction projects, which often require full contractual funding prior to award, and the prerequisite of sustained funding levels for annual operations and maintenance.

Examples of critical facility and infrastructure investments to support the needs of these modern research institutions include:

- Replacement of aging underground site utility distribution systems that are failing at an accelerated frequency;
- Replacement of aging, obsolete, failed mechanical systems, which includes heating and cooling coils, chillers, condenser units, exhaust fans, condensate receivers, vacuum pumps, and steam traps that are well beyond their useful life;
- Replacement of the failing 1950's and 1960's pneumatic heating, ventilation, and air conditioning control systems with current-day direct digital systems to address the buildings' supply/return/exhaust air rebalancing issues;
- Replacement of aging and failing electrical distribution systems to provide safe working conditions and to accommodate current and expanding research capacity requirements;
- Replacement of motor control centers, transformers, switchgear, network protectors, buss ducts, panels, UPS systems, fire alarm systems, and variable frequency drives that manufacturers no longer support and for which parts are no longer available;
- Replacement of the aging and obsolete 30-year old IT network infrastructure that can no longer support the capacity and speed required by facility and scientific systems;
- Replacement of the aging mechanical and electrical systems that can no longer support the load requirement of IT systems;
- Address degradations to the buildings' envelope exteriors and interior architectural systems – energy inefficient and/or leaking windows and doors, uninsulated rollup doors that do not seal, below grade water infiltration through foundation cracks, worn out ceilings and flooring, and lack of insulation in exterior walls;
- Replacement of roofs;
- Refurbishment of elevators;
- Repair leaks and address the deterioration of underground potable water, sewer, electrical feeder, and compressed air systems;
- Updating buildings and exterior pathways to be ADA compliant;
- Abatement of asbestos; and
- Repair of deteriorating road, parking lot, and sidewalk surfaces.

Statement of Operating Objectives

Facilities that can maintain environmental conditions (temperature, relative humidity, and air quality) are essential to NIST laboratory programs to advance in the field of quantum information science and technology; to produce transformative technologies and scientific breakthroughs in artificial intelligence that will improve American lives; and to pursue the fields of advanced textile and apparel research (including manufacturing techniques), cybersecurity, 5G telecommunications, forensic sciences, environmental measurements and others. NIST measurement capabilities must be maintained at the highest levels of precision and accuracy to meet the increasing requirements of its users. Facilities that can maintain ideal environmental conditions would eliminate lost productivity by researchers who currently spend their valuable time recalibrating scientific instruments. If researchers could work in optimal research environments, efficiency and effectiveness would increase providing the opportunity to maximize their time 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 relies on Safety, Capacity, Maintenance, and Major Repairs (SCMMR) funds to maintain and upgrade facilities at a level necessary to carry out the mission of NIST and DOC. For decades, NIST's SCMMR funding has been below the estimated value for maintaining its facilities and well below the funding required to improve "facilities in a declining state."[5] The infrastructure of NIST's Boulder and Gaithersburg campuses is nearing 60 to 70 years old and is beginning to fail. These campuses are akin to small cities that have utility distribution systems and infrastructure that need to be maintained and replaced as equipment exceeds its useful life and parts become obsolete or facilities could fail and then research work would cease.

NIST's facilities backlog at the end of FY 2020 included $627.6 million in building and $206.9 million in site and utility infrastructure projects. Numerous major utility infrastructure systems are currently in critical condition, creating risks of catastrophic failure of entire laboratory buildings. Degrading pipes have been the primary cause of water loss at the Gaithersburg campus. Over the past three years, a temporary fix was installed to mitigate this loss from 65,000 gallons of per day to the current level of 50,000 gallons daily. While this temporary fix was installed to mitigate these losses, the underground piping downstream has now started losing equivalent amounts of water. A large portion of the water being lost is potentially undermining the electrical distribution system to the south campus creating a potential loss of steam and power to the end of campus which houses some of the most sensitive research at NIST. Additionally, an electrical panel for one of the main electrical feeders to the Gaithersburg campus had an explosion in it and took out the electrical feeder. For several weeks, numerous laboratory buildings on the Gaithersburg campus were operating with only one electrical service where they typically have three. Mechanical failures in Gaithersburg led to evacuating roughly 60 staff for two to three years until a project can be implemented to replace the systems in the spaces since the space is now non-occupiable. Major electrical and mechanical equipment at both campuses are beyond their useful life - no longer supported by the manufacturers, replacement parts are non-existent, and the equipment is failing at an accelerated rate. IT infrastructure replacement is now included in the utility infrastructure to be upgraded and replaced in conjunction with other utilities. NIST's needs for high speed IT infrastructure is critical to its mission, as modernizing will enable the speed, reliability, and capacity needed to meet the large data and computing demands of high-technology research facilities.

Sixty five percent of NIST's facilities have not been renovated or newly constructed in the last 20 years. The declining condition of the facilities shows a strong justification for increasing SCMMR funding over several years until the facilities can be brought back above the minimum Facility Condition Index values established by DOC. Use of industry standards, benchmarks, and NRC guidelines ensures the lowest cost possible to the taxpayer while enabling agencies to receive the investment necessary to support work toward improving facilities deficiencies. Principal criteria used in establishing priorities include protection of the Government's investment, health and safety of building occupants, and repairs and alterations that avert deterioration and damage to buildings with continued support to facility systems and equipment. As NIST effectively implements current and proposed spend plans essential to long-term positioning of resources to improve deficiencies, consistent annual funding adhering to industry norms and guidelines is essential.

[5] National Research Council. 1990. Committing to the Cost of Ownership: Maintenance and Repair of Public Buildings. Washington, D.C.: National Academy Press.

Example objectives of SCMMR funding:

- Develop a utility infrastructure specific replacement program that will:
  - Continue repairs/replacements of utility systems, exhaust and air filtration systems, mechanical-electrical systems, and site alarm fire safety systems that are failing at an accelerated rate because they are over 50 years old;
  - Continue site utility infrastructure upgrades and repairs/replacements, to include underground electrical, chilled water, steam, condensate and natural gas distribution systems;
  - Continue site infrastructure upgrades and repairs, to include roads, loading docks, pedestrian walk areas, and storm water drainage; and
  - Continue site upgrades to the IT network infrastructure.
- Enable or maintain building environmental conditions required for meeting scientific requirements;
- Continue the repair and upgrade of facilities that have a high impact on staff and visitor safety;
- Continue abatement of hazardous materials from site buildings and structures;
- Continue modifications of facilities to comply with the Access to Federal Buildings Act, the Architectural Barriers Act, and the Americans with Disabilities Act;
- Continue to reduce the backlog of deferred maintenance projects including major renovation projects; and
- Intensify targeted energy conservation, water efficiency, and building system upgrades to facilitate meeting the sustainability requirements stipulated in Executive Order 13693.

Multi-Year Budget Information ($ in millions)

Major Cost Categories	FY 2020 and Prior	FY 2021	FY 2022	FY 2023	Cost to Complete
Building 1 Renovation (B1R) Design and Limited Renovation of Building 3	$12.0				
B1R Exterior Renovations	14.8				
B1R Wing 3	15.0				
B1R Wing 6	15.7				
B1R Swing Space	3.9				
B3R	18.0				
B1R Wing 4, Wing 5 and Limited Center Spine [1]	146.0 [1]				$30.0 [1]
Remaining Components of Building 1: Wing 1, Wing 2, and Headhouse [2]					150.0 [2]
Building 3 Addition [3]				$30.0 [3]	
Building 245 Modernization [4]	327.0				65.0 [4]
Building 222 Modernization [5]		$5.4		350.0 [5]	
Gates A&F [6]		0.7			50.0 [6]

[1] In FY 2020, $43 million funded Wing 4 and Wing 5, including FF&E; this funding does not cover delay and impact costs due to COVID-19 during the construction phase. In FY 2024, $30 million will be required to complete the limited center spine, including FF&E.

[2] Will not be completed with $294 million from the General Services Administration (GSA) Federal Capital Revolving Fund (FCRF) as proposed in the FY 2021 President's budget. The current estimate for completion is $150 million, including FF&E.

[3] In FY 2023, $30 million, including FF&E, will be required to complete an addition to Building 3 per the approved campus master plan. This addition will provide the swing space requirements for advanced telecommunications laboratories to move out of the limited center spine so that the Building 1 renovation project can be completed.

[4] If $65 million, including FF&E, is not provided in FY 2022, the project will not be completed in early CY 2024 as currently scheduled and the additional funding to complete it will most likely increase due to delays.

[5] The current estimate to complete this project, including FF&E, is $350 million if funding is provided in FY 2023.

[6] The current estimate to complete this project, including FF&E, is $50 million if funding is provided in FY 2025.

Explanation and Justification

Line Item		2020 Actual		2021 Enacted		2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Construction and Major Renovations	Pos./BA	0	$43,000	0	$6,095	0	$6,095
	FTE/Obl	0	69,322	0	6,095	0	6,095
Safety, Capacity, Maintenance And Major Repairs	Pos./BA	116	75,000	116	73,905	116	75,905
	FTE/Obl	110	73,575	110	303,653	110	75,905
External Projects	Pos./BA	0	0	0	0	0	0
	FTE/Obl	0	0	0	885	0	0

Construction of Research Facilities (Total Funding: $82 million and 116 Positions)

With Construction and Major Renovation base funding, $6.1 million will be used to fund projects in Gaithersburg, MD: (1) the early planning and programming efforts for relocation of laboratory facilities in Building 222 to internal swing spaces as well as early construction management support services and (2) funding for the B245 Modernization project to fund continued program management, IT and security upgrades and project contingency for the A-Wing work awarded in FY 2021. These projects are included in the NIST Integrated Master Plans Implementation Report to Congress.

With SCMMR base funding, NIST will fund annual labor, operations and maintenance expenses as well as prioritize its efforts to maintain, repair, improve and upgrade its facilities to address its highest priority SCMMR projects. If major facilities-related emergency situations arise, previously planned facilities work will be reprioritized as appropriate.

No other private sector, or government entity has the capability, capacity, or mission to provide the types of services as those provided by NIST.

NIST Campus - Implementation Plan

NIST awarded a contract to develop a 20-year implementation plan for the Gaithersburg and Boulder master plans. This combined plan includes timing, phasing, and budget estimates for each project. The contractor conducted a lengthy analysis of each campus and the associated master plan. In October 2020, the final report was submitted to the DOC for submission to Congress.[6]

[6] S.Rept. 115-275, page 25 – "The Committee is supportive of meeting NIST's physical infrastructure needs and directs it to develop an implementation plan for each of its master plans. The implementation plan shall be submitted with the fiscal year 2020 budget submission and shall include timing and phasing of projects along with current and projected budget estimates for each of the projects identified."

Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
PROGRAM CHANGES FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Construction and major renovations	Pos/BA	0	$6,095	0	0	0	($6,095)
	FTE/Obl.	0	6,095	0	0	0	(6,095)

FY 2021 Studies decrease (-$6,095, 0 FTE/0 Positions) - NIST requests a decrease in the amount of $6.1 million to reflect the one-time construction drop out for the early programming and planning studies for the Building 222 modernization and Gates A&F projects.

Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
PROGRAM CHANGE DETAIL BY OBJECT CLASS

(Direct Obligations amounts in thousands)

Activity: Construction and Major Renovations

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$10,511	$10,858	0	0	0
11.3	Other than full-time permanent	0	0	0	0	0
11.5	Other personnel compensation	348	455	0	0	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	10,859	11,313	0	0	0
12.1	Civilian personnel benefits	3,550	3,857	0	0	0
13	Benefits for former personnel	1	1	0	0	0
21	Travel and transportation of persons	12	12	0	0	0
22	Transportation of things	14	14	0	0	0
23	Rent, communications, and utilities					
23.1	Rental payments to GSA	3	3	0	0	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and misc. charges	2,911	2,924	0	0	0
24	Printing and reproduction	3	3	0	0	0
25	Other contractual services					
25.1	Advisory and assistance services	1,842	6,095	0	0	0
25.2	Other services from non-Federal sources	43,414	134,686	$6,095	0	($6,095)
25.3	Other goods and services from Federal sources	192	193	0	0	0
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	0	0	0	0	0
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	1,190	1,207	0	0	0
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	1,224	1,247	0	0	0
31	Equipment	3,515	2,215	0	0	0
32	Lands and structures	74,167	145,279	0	0	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	0	699	0	0	0
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	142,897	309,748	6,095	0	(6,095)

Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
PROGRAM CHANGES FOR 2022
(Dollar amounts in thousands)

		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Safety, Capacity, Maintenance and Major Repairs	Pos/BA	0	$75,905	0	$140,000	0	$64,095
	FTE/Obl.	0	75,905	0	140,000	0	64,095

Repair and Revitalization of NIST Facilities ($64,095, 0 FTE/0 Positions) - NIST is requesting $140 million to make steady year over year progress in addressing its major utility infrastructure maintenance backlog (steam, electrical, chilled water, etc.) and to modernize its IT networking infrastructure to deliver the speed, reliability, and capacity needed to meet the large data and computing demands of high-technology research facilities. This funding would support infrastructure improvements and enhancement of research space across the Gaithersburg, MD and Boulder, CO campuses ensuring that NIST is able to support a leading-edge research and development program that advances U.S. innovation in fields of quantum information science, artificial intelligence, advanced manufacturing, cybersecurity, privacy, and 5G telecommunications. Funds would also be utilized to upgrade IT networks which would enable NIST researchers to manage and analyze volumes of data generated from cutting-edge research and to effectively exchange large volumes of research data between NIST sites, and collaborate with National Labs (e.g. Argonne and Brookhaven National Laboratories), and other institutions.

Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
PROGRAM CHANGE DETAIL BY OBJECT CLASS

(Direct Obligations amounts in thousands)

Activity: Construction and Major Renovations

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11.1	Full-time permanent compensation	$10,511	$10,858	$11,105	$11,105	0
11.3	Other than full-time permanent	0	0	0	0	0
11.5	Other personnel compensation	348	455	466	466	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	10,859	11,313	11,571	11,571	0
12.1	Civilian personnel benefits	3,550	3,857	4,370	4,370	0
13	Benefits for former personnel	1	1	1	1	0
21	Travel and transportation of persons	12	12	12	60	$48
22	Transportation of things	14	14	14	15	1
23	Rent, communications, and utilities					
23.1	Rental payments to GSA	3	3	3	3	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and misc. charges	2,911	2,924	75	1,336	1,261
24	Printing and reproduction	3	3	3	13	10
25	Other contractual services					
25.1	Advisory and assistance services	1,842	6,095	2,000	2,000	0
25.2	Other services from non-Federal sources	43,414	134,686	54,032	116,255	62,223
25.3	Other goods and services from Federal sources	192	193	194	396	202
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	0	0	0	0	0
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	1,190	1,207	1,230	1,390	160
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	1,224	1,247	1,271	1,391	120
31	Equipment	3,515	2,215	1,129	1,199	70
32	Lands and structures	74,167	145,279	0	0	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	0	699	0	0	0
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	142,897	309,748	75,095	140,000	64,095

Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
SUMMARY OF REQUIREMENTS BY OBJECT CLASS
(Dollar amounts in thousands)

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/(Decrease) from 2022 Base
11	Personnel compensation					
11.1	Full-time permanent	$10,511	$10,858	$11,105	$11,105	0
11.3	Other than full-time permanent	0	0	0	0	0
11.5	Other personnel compensation	348	455	466	466	0
11.9	**Total personnel compensation**	10,859	11,313	11,571	11,571	0
12.1	Civilian personnel benefits	3,550	3,857	4,370	4,370	0
13	Benefits for former personnel	1	1	1	1	0
21	Travel and transportation of persons	12	12	12	60	$48
22	Transportation of things	14	14	14	15	1
23.1	Rental payments to GSA	3	3	3	3	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and miscellaneous charges	2,911	2,924	75	1,336	1,261
24	Printing and reproduction	3	3	3	13	10
25.1	Advisory and assistance services	1,842	6,095	2,000	2,000	0
25.2	Other services from non-Federal sources	43,414	134,686	60,127	116,255	56,128
25.3	Other goods and services from Federal sources	192	193	194	396	202
25.5	Research and development contracts	0	0	0	0	0
25.7	Operation and maintenance of equipment	1,190	1,207	1,230	1,390	160
26	Supplies and materials	1,224	1,247	1,271	1,391	120
31	Equipment	3,515	2,215	1,129	1,199	70
32	Land and structures	74,167	145,279	0	0	0
41	Grants, subsidies, and contributions	0	699	0	0	0
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
99	Total Obligations	142,897	309,748	82,000	140,000	58,000

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/(Decrease) from 2022 Base
99	Total Obligations	$142,897	$309,748	$82,000	$140,000	$58,000
	Less prior year recoveries	(654)	0	0	0	0
	Less prior year refunds	(12)	0	0	0	0
	Less prior year unobligated balance	(253,979)	(229,748)	0	0	0
	Plus unobligated balance end of year	229,748	0	0	0	0
	Total Budget Authority/Appropriation	118,000	80,000	82,000	140,000	58,000
	Personnel Data					
	Full-time equivalent employment:					
	Full-time permanent	111	110	110	110	0
	Other than full-time permanent	0	0	0	0	0
	Total	111	110	110	110	0
	Authorized Positions:					
	Full-time permanent	116	116	116	116	0
	Other than full-time permanent	0	0	0	0	0
	Total	116	116	116	116	0

Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
APPROPRIATION LANGUAGE AND CODE CITATIONS

1. For construction of new research facilities, including architectural and engineering design, and for renovation and maintenance of existing facilities, not otherwise provided for the National Institute of Standards and Technology, as authorized by 15 U.S.C. 278c-278e.

   15 U.S.C. 278c authorizes that the Secretary of Commerce to acquire land for such field sites as are necessary for the proper and efficient conduct of the activities authorized.

   15 U.S.C. 278d authorizes that the Secretary of Commerce to undertake such construction of buildings and other facilities and to make such improvements to existing buildings, grounds, and other facilities as are necessary for the proper and efficient conduct of authorized activities.

   15 U.S.C. 278e provides that in the performance of the functions of the National Institute of Standards and Technology the Secretary of Commerce is authorized to undertake: the care, maintenance, protection, repair, and alteration of Institute buildings and other plant facilities, equipment, and property.

2. For construction of new research facilities, including architectural and engineering design, and for renovation and maintenance of existing facilities, not otherwise provided for the National Institute of Standards and Technology, as authorized by sections 13 through 15 of the National Institute of Standards and Technology Act (15 U.S.C. 278c-278e), $140,000,000, to remain available until expended: *Provided*, That the Secretary of Commerce shall include in the budget justification materials for fiscal year 2022 that the Secretary submits to Congress in support of the Department of Commerce budget (as submitted with the budget of the President under section 1105(a) of title 31, United States Code) an estimate for each National Institute of Standards and Technology construction project having a total multi-year program cost of more than $5,000,000, and simultaneously the budget justification materials shall include an estimate of the budgetary requirements for each such project for each of the 5 subsequent fiscal years. (Department of Commerce Appropriations Act, 2021.)

3. Public Law 110-69, America Competes Act, 121 Stat 572, passed August 9, 2007 reauthorizes the Construction of Research Facilities appropriation through 2010. It also provided for the Retention of Fees to the Construction of Research Facilities account. “The Director is authorized to retain all building use and depreciation surcharge fees collected pursuant to OMB Circular A-25. Such fees shall be collected and credited to the Construction of Research Facilities Appropriation Account for use in maintenance and repair of the Institute's existing facilities”. Public Law 111-358, America Competes Reauthorization Act, 2010, 124 Stat 3982, passed January 4, 2011 reauthorized the Construction of Research Facilities appropriation through 2013.

Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
ADVISORY AND ASSISTANCE SERVICES
(Obligations in thousands of dollars)

	FY 2020 Actual	FY 2021 Enacted	FY 2022 Estimate
Consulting Services			
Management and professional support services	0	0	0
Studies, analyses, and evaluations	0	0	0
Engineering and technical services	$1,842	$6,095	$2,000
Total	1,842	6,095	2,000

Significant Activities

Advisory and assistance services funded by the Construction of Research Facilities appropriation includes assisting the development of program requirements for addition, replacement, and consolidation of existing facilities and structures, services for interior and exterior signage standards, and conceptual design for new facilities.

Need for Advisory and Assistance Services

NIST uses outside professional support and engineering and technical services whenever necessary expertise is not available in-house to ensure the safety of NIST staff and visitors. These services provide for Construction of Research Facilities mainly relate to building construction architectural systems, facilities capital planning, and safety.

Department of Commerce
National Institute of Standards and Technology
Working Capital Fund
SUMMARY OF RESOURCE REQUIREMENTS
(Dollar amounts in thousands)

	Positions	FTE	Budget Authority	Direct Obligations
Enacted, 2021	674	674	0	0
Adjustment to account for overhead positions and FTE for NIST Public Safety Communications Research Fund program in its winding down in FY 2022	10	10	0	0
2022 Base	684	684	0	0
Transfer from STRS program changes for equipment investments	0	0	0	0
2022 Estimate	684	684	0	0

Department of Commerce
National Institute of Standards and Technology
Working Capital Fund
SUMMARY OF REIMBURSABLE OBLIGATIONS
(Dollar amounts in thousands)

	2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
Comparison by activity/subactivity	FTE	Amount	FTE	Amount	FTE	Amount	FTE	Amount	FTE	Amount
Laboratory Programs										
WCF transfer		0		0		0		0		0
Reimbursables	532	$140,846	631	$145,826	641	$141,612	641	$141,612	0	0
WCF investments	0	14,876	0	12,860	0	0	0	0	0	0
Subtotal	532	155,722	631	158,686	641	141,612	641	141,612	0	0
Corporate Services										
WCF transfer		0		0		0		0		0
Reimbursables	12	4,580	15	4,926	15	4,993	15	4,993	0	0
WCF investments	0	(23)	0	161	0	0	0	0	0	0
Subtotal	12	4,557	15	5,087	15	4,993	15	4,993	0	0
Standards Coordination and Special Programs [1/]										
WCF transfer		0		0		0		0		0
Reimbursables	23	7,526	28	9,885	28	10,012	28	10,012	0	0
WCF investments	0	(142)	0	13	0	0	0	0	0	0
Subtotal	23	7,384	28	9,898	28	10,012	28	10,012	0	0
Manufacturing USA										
WCF transfer		0		0		0		0		0
Reimbursables	0	144	0	0	0	0	0	0	0	0
WCF investments	0	(2)	0	1	0	0	0	0	0	0
Subtotal	0	142	0	1	0	0	0	0	0	0
Hollings Manufacturing Extension Partnership										
WCF transfer		0		0		0		0		0
Reimbursables	0	456	0	1,500	0	0	0	0	0	0
WCF investments	0	(12)	0	6	0	0	0	0	0	0
Subtotal	0	444	0	1,506	0	0	0	0	0	0

	2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
	FTE	Amount	FTE	Amount	FTE	Amount	FTE	Amount	FTE	Amount
Total, NIST Reimbursable Services										
WCF transfer	0	0	0	0	0	0	0	0	0	0
Reimbursables	567	$153,552	674	$162,137	684	$156,617	684	$156,617	0	0
WCF investments	0	14,697	0	13,041	0	0	0	0	0	0
Grand Total	567	168,249	674	175,178	684	156,617	684	156,617	0	0

[1/] Includes Baldrige Performance Excellence Program (BPEP).

Department of Commerce
National Institute of Standards and Technology
Working Capital Fund
SUMMARY OF FINANCING
(Dollar amounts in thousands)

	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
Total Obligations	$168,249	$175,178	$156,617	$156,617	0
Offsetting collections from:					
Federal funds	(103,044)	(99,308)	(94,684)	(94,684)	0
Non-Federal sources	(60,789)	(75,870)	(61,933)	(61,933)	0
Unobligated balance, start of year	(154,951)	(150,386)	(150,386)	(150,386)	0
Unobligated balance, end of year	150,386	150,386	150,386	150,386	0
Change in uncollected customer payments - Federal	149	0	0	0	0
Budget Authority	0	0	0	0	0
Financing:					
Transfer from other accounts	0	0	0	0	0
Appropriation	0	0	0	0	0

Department of Commerce
National Institute of Standards and Technology
Working Capital Fund
PROGRAM AND PERFORMANCE: REIMBURSABLE OBLIGATIONS
(Dollar amounts in thousands)

Activity: NIST Reimbursable Services

Comparison by activity/subactivity		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Laboratory Programs	Pos./BA	643	$155,722	631	$158,686	641	$141,612	641	$141,612	0	0
	FTE/Obl.	532	155,722	631	158,686	641	141,612	641	141,612	0	0
Corporate Services	Pos./BA	15	4,557	15	5,087	15	4,993	15	4,993	0	0
	FTE/Obl.	12	4,557	15	5,087	15	4,993	15	4,993	0	0
Standards Coordination	Pos./BA	28	7,384	28	9,898	28	10,012	28	10,012	0	0
and Special Programs [1/]	FTE/Obl.	23	7,384	28	9,898	28	10,012	28	10,012	0	0
Manufacturing USA	Pos./BA	0	142	0	1	0	0	0	0	0	0
	FTE/Obl.	0	142	0	1	0	0	0	0	0	0
Hollings Manufacturing	Pos./BA	0	444	0	1,506	0	0	0	0	0	0
Extension Partnership	FTE/Obl.	0	444	0	1,506	0	0	0	0	0	0
WCF investments	Pos./BA	686	168,249	674	175,178	684	156,617	684	156,617	0	0
Total	FTE/Obl.	567	168,249	674	175,178	684	156,617	684	156,617	0	0

[1/] Includes Baldrige Performance Excellence Program (BPEP).

Department of Commerce
National Institute of Standards and Technology
Working Capital Fund
JUSTIFICATION OF PROGRAM AND PERFORMANCE

Activity: NIST Working Capital Fund

There is no base funding for the program.

This Working Capital Fund (WCF) reflects the full-time equivalent employment and reimbursable obligations associated with the reimbursable work performed by NIST for other agencies, the public, and WCF investments. NIST's reimbursable services consist of technical work performed for other federal agencies; state and local governments; and the private sector, including calibrations and special tests, advisory services, the sale of Standard Reference Materials and Baldrige Performance Excellence Program fees.

The unique measurement and standards expertise, developed with appropriated funding, gives NIST the capability to perform these services on a reimbursable basis. NIST accepts other agency work, based on an established set of criteria, which include: the need for traceability of measurements to national standards; the need for work which cannot or will not be addressed by the private sector; work supported by legislation that authorizes or mandates certain services; work which would result in an unavoidable conflict of interest if carried out by the private sector or regulatory agencies; and requests by the private sector for NIST action or services.

Department of Commerce
National Institute of Standards and Technology
Working Capital Fund
SUMMARY OF REQUIREMENTS BY OBJECT CLASS
(Dollar amounts in thousands)

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11	Personnel compensation					
11.1	Full-time permanent	$66,574	$71,439	$71,618	$71,618	0
11.3	Other than full-time permanent	5,301	5,301	5,301	5,301	0
11.5	Other personnel compensation	1,055	1,055	1,055	1,055	0
11.9	**Total personnel compensation**	72,930	77,795	77,974	77,974	0
12.1	Civilian personnel benefits	24,379	25,483	25,518	25,518	0
13	Benefits for former personnel	6	6	6	6	0
21	Travel and transportation of persons	464	493	298	298	0
22	Transportation of things	316	322	194	194	0
23.1	Rental payments to GSA	26	27	28	28	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and miscellaneous charges	3,545	3,550	3,427	3,427	0
24	Printing and reproduction	62	65	39	39	0
25.1	Advisory and assistance services	46	37	38	38	0
25.2	Other services from non-Federal sources	6,922	7,197	4,347	4,347	0
25.3	Other goods and services from Federal sources	4,964	4,989	4,757	4,757	0
25.5	Research and development contracts	14,666	14,825	8,955	8,955	0
25.7	Operation and maintenance of equipment	4,817	5,027	3,036	3,036	0
26	Supplies and materials	10,284	10,480	6,624	6,624	0
31	Equipment	16,029	16,029	16,029	16,029	0
32	Land and structures	0	0	0	0	0
41	Grants, subsidies, and contributions	8,792	8,853	5,347	5,347	0
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	1	0	0	0	0
99	Total Obligations	168,249	175,178	156,617	156,617	0

Personnel Data	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
Full-time equivalent employment:					
Full-time permanent	509	616	626	626	0
Other than full-time permanent	58	58	58	58	0
Total	567	674	684	684	0
Authorized Positions:					
Full-time permanent	664	652	662	662	0
Other than full-time permanent	22	22	22	22	0
Total	686	674	684	684	0

Department of Commerce
National Institute of Standards and Technology
Working Capital Fund
ADVISORY AND ASSISTANCE SERVICES
(Obligations in thousands of dollars)

	FY 2020 Actual	FY 2021 Enacted	FY 2022 Estimate
Consulting Services			
Management and professional support services	$4	$5	$5
Studies, analyses, and evaluations	39	32	33
Engineering and technical services	3	0	0
Total	46	37	38

Significant Activities

Advisory and assistance services funded by the Working Capital Fund represent services funded by reimbursable funds in support of reimbursable work conducted at NIST.

Need for Advisory and Assistance Services

Advisory and Assistance services have been necessary to obtain additional expertise for conducting activities like the technical evaluation of the Department of Defense in its Manufacturing Innovation Institutes, for example.

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Department of Commerce
National Institute of Standards and Technology
NIST Public Safety Communications Research Fund
SUMMARY OF RESOURCE REQUIREMENTS - MANDATORY
(Dollar amounts in thousands)

	Positions	FTE	Budget Authority	Direct Obligations	Appro-priation
Enacted, 2021	0	0	0	0	0
2022 Adjustments to Base	0	0	0	0	0
2022 Base/Estimate	0	0	0	0	0

Comparison by activity/subactivity with totals by activity		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/(Decrease) from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
NIST Public Safety Communications Research Fund	Pos/Approp	0	0	0	0	0	0	0	0	0	0
	FTE/Obl.	0	0	0	0	0	0	0	0	0	0
Budget Authority/Appropriation		0	0	0	0	0	0	0	0	0	0

Department of Commerce
National Institute of Standards and Technology
NIST Public Safety Communications Research Fund
PROGRAM AND PERFORMANCE: REIMBURSABLE OBLIGATIONS
(Dollar amounts in thousands)

Comparison by activity/subactivity		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/(Decrease) from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
NIST Public Safety Communications											
Research Fund	Pos/Approp	80	0	97	0	87	0	87	0	0	0
	FTE/Obl.	97	$51,122	97	$71,921	87	$36,746	87	$36,746	0	0

Department of Commerce
National Institute of Standards and Technology
NIST Public Safety Communications Research Fund
SUMMARY OF FINANCING - MANDATORY
(Dollar amounts in thousands)

	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
Total Obligations	$51,122	$71,921	$36,746	$36,746	0
Adjustments for:					
Recoveries	(1,286)	0	0	0	0
Refunds	(1)	0	0	0	0
Unobligated balance, start of year (Mandatory)	(158,502)	(108,667)	(36,746)	(36,746)	0
Unobligated balance from offsetting collections, end of year	108,667	36,746	0	0	0
Budget Authority/Appropriation - Mandatory Account	0	0	0	0	0

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Department of Commerce
National Institute of Standards and Technology
NIST Public Safety Communications Research Fund
PROGRAM AND PERFORMANCE: MANDATORY
(Dollar amounts in thousands)

Activity: NIST Public Safety Communications Research Fund

Line Item		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
NIST Public Safety Communications	Pos/Approp	0	0	0	0	0	0	0	0	0	0
Research Fund	FTE/Obl.	0	0	0	0	0	0	0	0	0	0

Department of Commerce
National Institute of Standards and Technology
NIST Public Safety Communications Research Fund
PROGRAM AND PERFORMANCE: MANDATORY
(Dollar amounts in thousands)

Activity: NIST Public Safety Communications Research Fund

Comparison by activity/subactivity		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/(Decrease) from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
NIST Public Safety Communications	Pos/Approp	80	0	97	0	87	0	87	0	0	0
Research Fund	FTE/Obl.	97	$51,122	97	$71,921	87	$36,746	87	$36,746	0	0

Department of Commerce
National Institute of Standards and Technology
Mandatory Account: NIST Public Safety Communications Research Fund
JUSTIFICATION OF PROGRAM AND PERFORMANCE

Activity: NIST Public Safety Communications Research Fund

There is no base funding for the program.

As part of the Middle-Class Tax Relief and Job Creation Act of 2012, NIST has one-time (non-recurring) mandatory resources through the Public Safety Communications Research Fund (PSCRF) to help develop cutting-edge wireless technologies for public safety users. The PSCRF has authorized $300.0 million in mandatory funds from spectrum auction proceeds for NIST. In partnership with industry and public safety organizations, NIST will continue to conduct research and develop new standards, technologies and applications to advance public safety communications in support of FirstNet's efforts to build an interoperable nationwide broadband network for first responders.

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Department of Commerce
National Institute of Standards and Technology
NIST Public Safety Communications Research Fund
SUMMARY OF REQUIREMENTS BY OBJECT CLASS - REIMBURSABLE OBLIGATIONS
(Dollar amounts in thousands)

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11	Personnel compensation					
11.1	Full-time permanent	$10,868	$11,027	$9,455	$9,455	0
11.3	Other than full-time permanent	2,281	2,304	2,226	2,226	0
11.5	Other personnel compensation	241	243	238	238	0
11.9	**Total personnel compensation**	13,390	13,574	11,919	11,919	0
12.1	Civilian personnel benefits	4,322	4,384	3,850	3,850	0
13	Benefits for former personnel	1	1	1	1	0
21	Travel and transportation of persons	189	100	200	200	0
22	Transportation of things	9	20	5	5	0
23.1	Rental payments to GSA	0	0	0	0	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and miscellaneous charges	721	721	721	721	0
24	Printing and reproduction	9	9	9	9	0
25.1	Advisory and assistance services	8,330	4,475	2,929	2,929	0
25.2	Other services from non-Federal sources	4,981	10,054	8,474	8,474	0
25.3	Other goods and services from Federal sources	2,697	233	0	0	0
25.5	Research and development contracts	2,370	233	0	0	0
25.7	Operation and maintenance of equipment	483	5,122	432	432	0
26	Supplies and materials	591	2,100	1,440	1,440	0
31	Equipment	891	11,213	5,612	5,612	0
32	Land and structures	0	0	0	0	0
41	Grants, subsidies, and contributions	12,138	19,682	1,154	1,154	0
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
99	Total Obligations	51,122	71,921	36,746	36,746	0

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
99	Total Obligations	$51,122	$71,921	$36,746	$36,746	0
	Adjustments for:					
	Recoveries	(1,286)	0	0	0	0
	Refunds of prior year paid obligations	(1)	0	0	0	0
	Unobligated balance from offsetting collections, start of year	(158,502)	(108,667)	(36,746)	(36,746)	0
	Unobligated balance from offsetting collections, end of year	108,667	36,746	0	0	0
	Appropriation	0	0	0	0	0
	Personnel Data					
	Full-time equivalent employment:					
	Full-time permanent:	73	73	64	64	0
	Other than full-time permanent	24	24	23	23	0
	Total	97	97	87	87	0
	Authorized Positions:					
	Full-time permanent	65	73	64	64	0
	Other than full-time permanent	15	24	23	23	0
	Total	80	97	87	87	0

Department of Commerce
National Institute of Standards and Technology
WIRELESS INNOVATION FUND
APPROPRIATION LANGUAGE AND CODE CITATIONS

1. For necessary expenses of the National Institute of Standards and Technology,

   15 U.S.C. 272; 273; 278b-j; p

   15 U.S.C. 272; 273; 278b-j; p provides basic authority for the performance of the functions and activities of the National Institute of Standards and Technology, authorizes appropriations for these purposes to be provided to the general public and specific institutions, governments, firms, and individuals, and requires the notification of Congress of a reprogramming of funds that exceeds a limit specified in public law.

2. MANDATORY ACCOUNT: Wireless Innovation (WIN) Fund: As part of the National Wireless Initiative included in the American Jobs Act, NIST also has resources through the Wireless Innovation (WIN) Fund to help develop cutting-edge wireless technologies for public safety users. The WIN Fund, $300 million in mandatory funds for NIST from the spectrum auction proceeds, helps industry and public safety organizations conduct research and develop new standards, technologies and applications to advance public safety communications in support of the initiative's efforts to build an interoperable nationwide broadband network for first responders. P.L. 112-96 established the Public Safety Communications Research Fund per section 6303 of the Middle Class Tax Relief and Job Creation Act of 2012. The fund’s availability extends through 2022 and began to execute in FY 2015; $92.7 million was transferred to NIST in FY 2015, $7.3 million was released from sequester in FY 2016, an additional $186.4 million was transferred in FY 2016, and $13.6 million was released from sequester in FY 2017. Currently, WIN has $108.7 million in total resources with $71.9 million available for obligation in FY 2021 and $36.8 million to be available in FY 2022. Additional transfers to NIST from NTIA are possible as proceeds from the spectrum auctions become available.

Department of Commerce
National Institute of Standards and Technology
NIST Public Safety Communications Research Fund
ADVISORY AND ASSISTANCE SERVICES
(Obligations in thousands of dollars)

	FY 2020 Actual	FY 2021 Enacted	FY 2022 Estimate
Consulting Services			
Management and professional support services	0	0	$1,700
Studies, analyses, and evaluations	$7,149	$3,253	7
Engineering and technical services	1,181	1,222	1,222
Total	8,330	4,475	2,929

Significant Activities
Advisory and assistance services funded by one-time (non-recurring) mandatory resources through the Public Safety Communications Research Fund (PSCRF) to help develop cutting-edge wireless technologies for public safety users.

Need for Advisory and Assistance Services
Advisory and Assistance services have been necessary to obtain additional expertise to conduct research and develop new standards, technologies and applications to advance public safety communications in support of FirstNet's efforts to build an interoperable nationwide broadband network for first responders.

Department of Commerce
National Institute of Standards and Technology
American Rescue Plan Act (P.L. 117-2)
SUMMARY OF RESOURCE REQUIREMENTS - MANDATORY
(Dollar amounts in thousands)

	Positions	FTE	Budget Authority	Direct Obligations	Appro-priation
Enacted Budget, 2021	11	8	$150,000	$150,000	$150,000
Less: American Rescue Plan Act (P.L. 117-2)	(11)	(8)	(150,000)	(150,000)	(150,000)
2022 Base/Estimate	0	0	0	0	0

Comparison by activity with totals by activity		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/(Decrease) from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
American Rescue Plan Act	Pos/Approp	0	0	11	$150,000	0	0	0	0	0	0
(P.L. 117-2)	FTE/Obl.	0	0	8	150,000	0	0	0	0	0	0
Budget Authority/Appropriation			0		150,000		0		0		0

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Department of Commerce
National Institute of Standards and Technology
American Rescue Plan Act (P.L. 117-2)
PROGRAM AND PERFORMANCE: MANDATORY
(Dollar amounts in thousands)

Activity: American Rescue Plan Act (P.L. 117-2)

Line Item		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
American Rescue Plan Act	Pos/Approp	0	0	11	$150,000	0	0	0	0	0	0
(P.L. 117-2)	FTE/Obl.	0	0	8	150,000	0	0	0	0	0	0

Department of Commerce
National Institute of Standards and Technology
Mandatory Account: American Rescue Plan Act (P.L. 117-2)
JUSTIFICATION OF PROGRAM AND PERFORMANCE

Activity: American Rescue Plan Act (P.L. 117-2)

There is no base funding for the program.

Public Law 117-2, The American Rescue Plan Act, (ARP Act) in Subtitle E – Science and Technology, Section 7501 (as enacted March 11, 2021) made available $150,000,000 for the National Institute of Standards and Technology's (NIST).

SEC. 7501. NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY.
In addition to amounts otherwise made available, there are appropriated to the National Institute of Standards and Technology for fiscal year 2021, out of any money in the Treasury not otherwise appropriated, $150,000,000, to remain available until September 30, 2022, to fund awards for research, development, and testbeds to prevent, prepare for, and respond to coronavirus. None of the funds provided by this section shall be subject to cost share requirements.

NIST will continue to execute these funds in FY 2022 for the Manufacturing USA program.

Department of Commerce
National Institute of Standards and Technology
American Rescue Plan Act (P.L. 117-2)
SUMMARY OF REQUIREMENTS BY OBJECT CLASS
(Dollar amounts in thousands)

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
11	Personnel compensation					
11.1	Full-time permanent	0	$958	0	0	0
11.3	Other than full-time permanent	0	0	0	0	0
11.5	Other personnel compensation	0	0	0	0	0
11.9	**Total personnel compensation**	0	958	0	0	0
12.1	Civilian personnel benefits	0	286	0	0	0
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	0	168	0	0	0
22	Transportation of things	0	13	0	0	0
23.1	Rental payments to GSA	0	0	0	0	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and miscellaneous charges	0	3,100	0	0	0
24	Printing and reproduction	0	18	0	0	0
25.1	Advisory and assistance services	0	0	0	0	0
25.2	Other services from non-Federal sources	0	2,291	0	0	0
25.3	Other goods and services from Federal sources	0	654	0	0	0
25.5	Research and development contracts	0	4,252	0	0	0
25.7	Operation and maintenance of equipment	0	58	0	0	0
26	Supplies and materials	0	357	0	0	0
31	Equipment	0	218	0	0	0
32	Land and structures	0	0	0	0	0
41	Grants, subsidies, and contributions	0	137,627	0	0	0
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
99	Total Obligations	0	150,000	0	0	0

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/Decrease from 2022 Base
99	Total Obligations	0	$150,000	0	0	0
	Adjustments for:					
	Recoveries	0	0	0	0	0
	Refunds of prior year paid obligations	0	0	0	0	0
	Unobligated balance from offsetting collections, start of year	0	0	0	0	0
	Unobligated balance from offsetting collections, end of year	0	0	0	0	0
	Appropriation	0	150,000	0	0	0
	Personnel Data					
	Full-time equivalent employment:					
	Full-time permanent:	0	8	0	0	0
	Other than full-time permanent	0	0	0	0	0
	Total	0	8	0	0	0
	Authorized Positions:					
	Full-time permanent	0	11	0	0	0
	Other than full-time permanent	0	0	0	0	0
	Total	0	11	0	0	0

Department of Commerce
National Institute of Standards and Technology
American Rescue Plan Act (P.L. 117-2)
APPROPRIATION LANGUAGE AND CODE CITATIONS

1. For necessary expenses of the National Institute of Standards and Technology,

   15 U.S.C. 272; 273; 278b-j; p

   15 U.S.C. 272; 273; 278b-j; p provides basic authority for the performance of the functions and activities of the National Institute of Standards and Technology, authorizes appropriations for these purposes to be provided to the general public and specific institutions, governments, firms, and individuals, and requires the notification of Congress of a reprogramming of funds that exceeds a limit specified in public law.

2. MANDATORY ACCOUNT: American Rescue Plan Act: Public Law 117-2, The American Rescue Plan Act, (ARP Act) in Subtitle E – Science and Technology, Section 7501 (as enacted March 11, 2021) made available $150,000,000 for the National Institute of Standards and Technology's (NIST), to remain available until September 30, 2022, to fund awards for research, development, and testbeds to prevent, prepare for, and respond to coronavirus. None of the funds provided by this section shall be subject to cost share requirements.

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Summary of National Institute of Standards and Technology (NIST)

The operations of the NIST Working Capital Fund are reported in a program and financing schedule printed in the President's Budget, as well as reflected in the reimbursable amounts throughout this budget. The fund finances the initial costs of work performed by NIST and is reimbursed by applicable appropriations and advances or reimbursements from other agencies. A detailed cost accounting system is used to ensure that the actual cost of work performed for each job or task is recorded and identified with the appropriate source of financing. In addition to its function as a revolving fund, the Working Capital Fund is also used to handle annual and sick leave on an accrued basis, to acquire equipment as an investment to be recovered through amortization charges to programs, to distribute indirect costs to programs as overhead, to carry the recoverable costs associated with the production of Standard Reference Materials, and to carry supply inventories until issued for program use.

The table below summarizes the total NIST program, according to the source of financing. Following this table is a summary of the NIST reimbursable program by sponsor and source of support.

Summary of Total NIST Discretionary Program [1/]

(Obligations in thousands)

Source and Use of Funds Spent		FY 2020 Perm. Pos. [2/]	FY 2020 FTE	FY 2020 Oblig.	FY 2021 Perm. Pos. [2/]	FY 2021 FTE	FY 2021 Oblig.	FY 2022 Perm. Pos. [2/]	FY 2022 FTE	FY 2022 Oblig.	Approp. Requested
Direct Funding											
Scientific and technical research and services		2,586	2,406	$750,422	2,637	2,529	$825,027	2,801	2,661	$918,570	$915,570
Industrial technology services		99	94	222,952	99	96	175,026	162	143	441,650	441,650
Construction of research facilities		116	111	142,897	116	110	309,748	116	110	140,000	140,000
Total, direct funding		2,801	2,611	1,116,271	2,852	2,735	1,309,801	3,079	2,914	1,500,220	1,497,220
Reimbursable Funding and WCF Investments											
Construction of research facilities - building surcharge		0	0	778	0	0	885	0	0	0	
Research, development and supporting services:											
Federal government		434	359	95,547	427	427	98,558	433	433	94,684	
Calibrations and tests, technical and advisory services:											
Federal government		23	19	6,834	23	23	7,553	23	23	7,344	
Public and non-federal government		91	75	26,327	89	89	29,100	91	91	28,291	
Subtotal, Services		114	94	33,161	112	112	36,653	114	114	35,635	
National Voluntary Laboratory Accreditation Program		24	20	3,803	23	23	4,280	24	24	4,405	
Standard reference materials (SRMs):											
SRM Sales:											
Federal government	168,249	2	2	322	2	2	373	2	2	374	
Public and non-federal government	168,249	112	92	18,506	110	110	21,523	111	111	21,519	
Subtotal, SRM sales		114	94	18,828	112	112	21,896	113	113	21,893	
SRM investment adjustment		0	0	2,213	0	0	0	0	0	0	
Subtotal, SRM		114	94	21,041	112	112	21,896	113	113	21,893	
Total, Reimbursable program		686	567	154,330 [3/]	674	674	162,272 [3/]	684	684	156,617 [3/]	
WCF Investments and Operating Adjustments											
WCF investments		0	0	16,372	0	0	27,924	0	0	27,924	
WCF operating adjustments		0	0	19,999	0	0	0	0	0	0	
Total, WCF Investments and operating adjustments		0	0	36,371	0	0	27,924	0	0	27,924	
Total, NIST program		3,487	3,178	1,306,972	3,526	3,409	1,499,997	3,763	3,598	1,684,761	
Offsetting adjustment for amortization of equipment		0	0	(21,674)	0	0	(14,883)	0	0	(27,924)	
Adjusted total, NIST program		3,487	3,178	1,285,298	3,526	3,409	1,485,114	3,763	3,598	1,656,837	

[1/] For comparison reason, mandatory funding, such as NIST PSCRFand American Rescue Plan (ARP) are not included.

[2/] Most NIST scientists and engineers are not engaged solely on one research project. Individuals may divide their time between two or more projects financed by different sources of support. Also, salary costs of many staff members are charged to an overhead account and subsequently prorated to all directly funded projects. For these reasons, it is not possible to report employment directly for any source of financing. The Permanent Positions above are statistically-derived numbers, based on the estimated work years distribution for NIST programs.

[3/] Total reimbursable numbers are different from the next section due to inclusion of CRF reimbursable obligations.

Department of Commerce

National Institute of Standards and Technology

REIMBURSABLE PROGRAM AND WORKING CAPITAL FUND INVESTMENTS

(Dollar amounts in thousands)

	FY 2020 Actual	FY 2021 Enacted	FY 2022 Estimate
Department of Defense			
Air Force	$9,377	$9,513	$9,431
Army	318	563	763
Navy	626	1,760	960
Other, Department of Defense	15,162	18,063	18,253
Subtotal, Department of Defense	25,483	29,899	29,407
Department of Agriculture	88	32	25
Department of Commerce	20,485	21,696	22,085
Department of Energy	5,574	2,726	2,718
Dept. of Health & Human Services	3,693	4,368	4,331
Dept. of Homeland Security	17,235	17,060	16,368
Dept. of Housing & Urban Development	44	0	0
Department of the Interior	13	0	0
Department of Justice	5,393	7,174	5,959
Department of State	0	750	0
Department of Transportation	478	1,025	1,063
Department of the Treasury	213	200	0
Department of Veterans Affairs	65	100	100
General Services Administration	26	259	9
National Aeronautics & Space Admin.	6,773	6,222	6,221
National Science Foundation	3,101	3,340	3,358
Nuclear Regulatory Commission	1,918	752	700
Other	4,965	3,705	2,340
Subtotal, Other Agency	95,547	99,308	94,684

	FY 2020 Actual	FY 2021 Enacted	FY 2022 Estimate
Calibrations & Testing	$5,631	$7,310	$7,310
Technical & Advisory Services	31,333	33,623	32,730
Standard Reference Materials	21,041	21,896	21,893
Subtotal, Other Reimbursables	58,005	62,829	61,933
Total, Reimbursable Program	153,552	162,137	156,617
Equipment Investments	16,372	27,924	27,924
IE Amortization	(21,674)	(14,883)	(27,924)
WCF Operating Adjustments	19,999	0	0
Total, WCF Investments	14,697	13,041	0
Total, Reimbursable Program and WCF Investments	168,249	175,178	156,617

Department of Commerce
National Institute of Standards and Technology
PERIODICALS, PAMPHLETS, AND AUDIOVISUAL PRODUCTS

Supplies and Materials	2020 Actual	2021 Enacted	2022 Estimate
Periodicals	0.0	0.0	0.0
Pamphlets	$10.0	$10.0	$10.0
Audiovisuals	75.0	85.0	85.0
Total	85.0	95.0	95.0

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. In order for our efforts to stimulate innovation, foster industrial competitiveness, and improve the quality of life, we need to broadly disseminate our work. NIST mainly accomplishes this through its primary public web site, www.nist.gov, and other subsidiary sites. We also produce collateral and AV materials, almost all of which direct individuals back to the www.nist.gov resource for additional information.

NIST produces one periodical a year, *The Journal of Research of the National Institute of Standards and Technology.* The final paper production was issued in January 2012 and the periodical is now issued electronically. The *Journal of Research of the National Institute of Standards and Technology* reports NIST research and development in metrology and related fields of physical science, engineering, applied mathematics, statistics, biotechnology, and information technology.

NIST produces a small number of printed products to be distributed at conferences where NIST exhibits. These products include postcards with images and a link on the back to the NIST website, a two-sided periodic table with more information about NIST science and metric conversion cards.

NIST's audiovisual products are mostly short (under 5 minute) videos created to highlight NIST's science, staff and/or history. These products are mainly distributed via the NIST website and social media channels and shared at conferences where NIST is exhibiting. As a result of NIST's leadership role to redefine the kilogram and implement a revised international system of measurement, NIST expanded its audiovisual portfolio to include the creation of animations.

Department of Commerce
National Institute of Standards and Technology
AVERAGE SALARY AND BENEFITS

	2020 Actual	2021 Enacted	2022 Estimate
Average ES	$262,317	$264,940	$272,094
Average scientific and professional	262,420	265,044	272,201
Average career path	171,302	173,015	177,686
Average ungraded positions	88,737	89,624	92,043

FY 2021 average salaries reflect a 1.0 percent pay raise and FY 2022 average salaries reflect a 2.7 percent pay raise. Benefits rate of 35% is used per the OPM rate assumption.

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Department of Commerce
National Institute of Standards and Technology
IMPLEMENTATION STATUS OF GAO AND OIG RECOMMENDATIONS

31 U.S.C. 720, as amended January 3, 2019, requires the head of a Federal agency to submit a written statement of the actions taken or planned on Government Accountability Office (GAO) recommendations to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 180 calendar days after the date of the report.

The Good Accounting Obligation in Government Act (GAO-IG Act), passed on January 3, 2019, (P.L. 115-414) requires each agency to include, in its annual budget justification, a report that identifies each public recommendation issued by GAO and the agency's office of the inspector general (OIG) which has remained unimplemented for one year or more from the annual budget justification submission date. In addition, the Act requires a reconciliation between the agency records and the IGs' Semiannual Report to Congress.

Section 1. Recommendations for which action plans were finalized since the last appropriations request.

Report Number	Report Title	Issue Date	Recommendation Number	Recommendation	Action(s) Planned	Action Status (Planned, In-Progress, or Complete)	Target Completion Date	Recommendation Status (Planned, In-Progress, or Complete)
GAO-20-81	Federal Research: Additional Actions Needed to Improve Publish Access to Research Results	11/21/2019	31	The National Institute of Standards and Technology Director should fully develop and implement a mechanism to ensure researcher compliance with the public access plan and associated requirements.	NIST will take the following actions to ensure researcher compliance with public access requirements: (1) NIST will develop an editorial review system to identify NIST-authored papers that have been published. Metadata for these papers will be compared to metadata for NIST-authored papers available through the NIST publications repository to ensure that all NIST authors are in compliance with the requirement that papers are made freely available within 12 months of publication. (2) NIST will evaluate the practicality of combining information in awardees' Research Performance Progress Reports with information provided by the Clearinghouse for the Open Research of the United States in order to associate publications with grants. (3) NIST reviewed Data Management Plans (DMPs) to evaluate the quality and awardees' compliance with the DMPs, as well as Federal Program Officers' compliance with the NIST requirement to	Complete	November 2020	Complete

Report Number	Report Title	Issue Date	Recommendation Number	Recommendation	Action(s) Planned	Action Status (Planned, In-Progress, or Complete)	Target Completion Date	Recommendation Status (Planned, In-Progress, or Complete)
					create a record for each awardee's data in the NIST data inventory system.			
GAO-20-299	Critical Infrastructure Protection: Additional Actions Needed to Identify Framework Adoption and Resulting Improvements	2/25/2020	1	The Director of NIST should establish time frames for completing NIST's initiatives, to include the information security measurement program and the cybersecurity framework starter profile, to enable the identification of sector-wide improvements from using the framework in the protection of critical infrastructure from cyber threats.	To further establish its Cybersecurity Measurement program, NIST will document the NIST Cybersecurity Measurement program's scope, objectives, and approach, including an inventory of existing measurement resources. The expected completion date is September 2020. To further amplify small business awareness of cybersecurity, and of the Cybersecurity Framework, NIST will develop and publish two (2) Cybersecurity Framework starter profiles tailored toward risk management of business processes important to small business owners.	Complete	October 2020	Complete
OIG-20-028-A	The Department Needs to Improve Oversight Practices to Close Out Contract Files by Complying with Federal Regulations and Departmental Requirements	6/2/2020	2	NIST Director of Office of Acquisition and Agreements Management (OAAM) establish a periodic control to ensure that contracts are being closed timely and that closeout procedures are in compliance with federal and Departmental regulations.	The NIST OAAM Director will ensure that the Policy and Compliance Group implements periodic controls to ensure that contracts are being closed timely and that closeout procedures follow federal and Departmental regulations. Semi-annual internal audits of the NIST closeout process by the Policy and Compliance Group will ensure that the Acquisition Management Division (AMD) is completing closeouts correctly and in a timely manner. These internal audits are expected to occur in October and January.	In-progress	May 2021	In-Progress
OIG-20-028-A	The Department Needs to Improve Oversight Practices to Close Out Contract Files by Complying with Federal Regulations and	6/2/2020	5	NIST Director of OAAM issue additional guidance and training on the contract closeout process to include clearly defining the requirements for adequate contract closeout file documentation.	The OAAM has developed additional guidance and training on the contract closeout process to include clearly defining the requirements for adequate contract closeout file documentation. This closeout process flowchart has been developed, in partnership with AMD, to serve as a desk reference and assist staff to follow a consistent process that ensures compliance with federal and Departmental regulations. The closeout flowchart was presented to AMD as part	Complete	August 2020	Complete

Report Number	Report Title	Issue Date	Recommendation Number	Recommendation	Action(s) Planned	Action Status (Planned, In-Progress, or Complete)	Target Completion Date	Recommendation Status (Planned, In-Progress, or Complete)
	Departmental Requirements				of the March policy meeting and posted to the training section of the internal AMD SharePoint site. The flowchart will be updated as training gaps or necessary refinements are identified.			
OIG-20-028-A	The Department Needs to Improve Oversight Practices to Close Out Contract Files by Complying with Federal Regulations and Departmental Requirements	6/2/2020	6	NIST AMD Chief conduct research to determine why key personnel were replaced and supplemented without the proper approvals and ensure that the questioned labor costs are recovered in a timely manner. We also recommend that the Chief ensure that all contracting personnel enforce the contract terms and conditions for all labor hour contracts.	1) The NIST AMD Chief conducted a further review and found that the Contracting Officer appropriately modified the contract replacing key personnel. Therefore, no improper payments were made. 2) The NIST Bureau Procurement Official (BPO) revised the existing Determination and Findings (D&F) template for use of Time-and-Materials and Labor Hour contract types for commercial items. This template was revised to include key personnel control language. 3) The NIST BPO developed new Determination and Findings (D&F) templates for use of Time-and-Materials and Labor Hour contract types for non-commercial and orders issued under Federal Supply Schedules. Both new templates include key personnel control language. All three D&F templates were presented to AMD as part of the April policy meeting and the templates were posted to the templates section of the internal AMD SharePoint site.	Complete	August 2020	Complete
OIG-20-028-A	The Department Needs to Improve Oversight Practices to Close Out Contract Files by Complying with Federal Regulations and Departmental	6/2/2020	8	We recommend that the NIST Acquisition Management Division Chief conduct research to determine why the improper payment occurred and ensure that future improper payments are identified and recovered in a timely manner.	1) The NIST AMD Chief conducted research to determine why the improper payment occurred and retrieved the $35,685. 2) The Policy and Compliance Group and the AMD Chief will work collaboratively to establish preventative measures to ensure the likelihood of future improper payments remains low. Additionally, Contracting Officers will be directed to remind appointed CORs of the importance of the role that they have	In-progress	May 2020	In-progress

Report Number	Report Title	Issue Date	Recommendation Number	Recommendation	Action(s) Planned	Action Status (Planned, In-Progress, or Complete)	Target Completion Date	Recommendation Status (Planned, In-Progress, or Complete)
	Requirements				in assuring accurate and complete service-related invoices.			
OIG-20-028-A	The Department Needs to Improve Oversight Practices to Close Out Contract Files by Complying with Federal Regulations and Departmental Requirements	6/2/2020	9	We recommend that the NIST Director of OAAM ensure that (a) contracting officers appoint in writing properly trained and certified CORs/TPOCs prior to awarding contracts, and (b) all CORs/TPOCs meet their continuous learning requirements and are certified at the appropriate levels.	NIST will examine the use of TPOCs vs CORs and ensure if COR duties are required that a COR is appointed. Additionally, OAAM will continue to monitor and ensure CORs have appropriate training to maintain their certifications and will encourage TPOCs to attain COR certification.	Complete	September 2020	Complete

Section 2. Implementation of GAO public recommendations issued no less than one year ago that are designated by GAO as 'Open' or 'Closed-Unimplemented.'

Open Recommendation(s) the Department has decided not to implement.

Report Number	17-3
Report Title	Climate Change: Improved Federal Coordination Could Facilitate Use of Forward-Looking Climate Information in Design Standards, Building Codes, and Certifications
Issue Date	November 30, 2016
Recommendation Number	1
Recommendation	To help reduce federal fiscal exposure by enhancing the resilience of infrastructure to extreme weather, we recommend that the Secretary of Commerce, through the Director of the National Institute of Standards and Technology (NIST), in consultation with the Mitigation Framework Leadership Group (MitFLG) and the United States Global Change Research Program (USGCRP), convene federal agencies for an ongoing governmentwide effort to provide the best available forward-looking climate information to standards-developing organizations for their consideration in the development of design standards, building codes, and voluntary certifications.
Reason for the Decision not to Implement	NIST has no immediate operational plans, but as a scientific, non-regulatory, non-oversight agency with the principal mission to advance measurement science, NIST will remain open should there be stakeholder interest in convening to discuss forward-looking climate information for potential use by the standards community. To date, NIST has not received any stakeholder interest in convening a discussion related to forward-looking climate information for use by the standards community.

Open Recommendation(s) the Department plans to implement.

Report Number	Report Title	Issue Date	Recommendation Number	Recommendation	Target Implementation Date	Closure Request Pending with GAO (Yes/No)	Clear Budget Implications (Yes/No)
17-320	Advanced Manufacturing: Commerce Could Strengthen Collaboration with Other Agencies on Innovation Institutes	April 6, 2017	1	To enhance interagency collaboration in the Manufacturing USA program, the Secretary of Commerce should direct the Director of NIST to work with all non-sponsoring agencies whose missions contribute to or are affected by advanced manufacturing to revise the Manufacturing USA governance system to ensure the roles and responsibilities for how these agencies could contribute to the Manufacturing USA program are fully identified.	Completed July 2018	Yes	
18-327	Federal Research: Additional Actions Needed to Improve Licensing of Patent Laboratory Inventions	June 19, 2018	1	The Secretary of Commerce should instruct NIST to fully report the range of challenges in federal patent licensing, such as those outlined in this report, by, for example, leveraging its survey of practices at federal technology transfer offices, past FLC studies, and agency reports and including that information in its summary reports to Congress.	Completed October 2019	Yes	
18-327	Federal Research: Additional Actions Needed to Improve Licensing of Patent Laboratory Inventions	June 19, 2018	2	The Secretary of Commerce should instruct NIST to clarify the link between establishing patent license financial terms and the goal of promoting commercial use, through appropriate means, such as the upcoming rule-making process and updating relevant guidance.	June 2021	No	
18-327	Federal Research: Additional Actions Needed to Improve Licensing of Patent Laboratory Inventions	June 19, 2018	3	The Secretary of Commerce should instruct NIST to facilitate formal information sharing among the agencies to provide federal labs with information on financial terms in comparable patent licenses, as appropriate.	Completed January 2021	Yes	
18-445	National Institute of Standards and Technology: Additional Review and Coordination Could Help Meet Measurement Service Needs and Strengthen Standards Activities	July 26, 2018	1	The NIST Associate Director for Laboratory Programs should update NIST policy to include periodic comprehensive management review of the agency's measurement services to assess gaps and ensure alignment with stakeholders' needs and take steps to ensure that the Associate Director completes the review of NIST's standards development activities.	Completed May 2019	Yes	
18-656	Science and Technology: Considerations for Maintaining U.S. Competitiveness in Quantum Computing, Synthetic Biology, and Other Potentially Transformational Research	September 26, 2018	2	As the QIS Subcommittee moves forward, the Department of Commerce co-chair, in coordination with other co-chairs and participating agency officials, should take steps to fully implement leading practices that enhance and sustain collaboration.	Completed November 2019	Yes	

Report Number	Report Title	Issue Date	Recommendation Number	Recommendation	Target Implementation Date	Closure Request Pending with GAO (Yes/No)	Clear Budget Implications (Yes/No)
	Areas						
19-265	Scientific Integrity Policies: Additional Actions Could Strengthen Integrity of Federal Research	April 4, 2019	6	The Director of NIST should develop mechanisms to regularly monitor and evaluate implementation of the agency's scientific integrity policy, including mechanisms to remediate identified deficiencies and make improvements where necessary.	April 2021	No	
19-409	Advanced Manufacturing: Innovation Institutes Have Demonstrated Initial Accomplishments, but Challenges Remain in Measuring Performance and Ensuring Sustainability	May 23, 2019	1	The Secretary of Commerce should direct the NIST Director to work with other sponsoring federal agencies to develop and implement network-wide performance goals for the Manufacturing USA program with measurable targets and time frames.	January 2021	Yes	
19-409	Advanced Manufacturing: Innovation Institutes Have Demonstrated Initial Accomplishments, but Challenges Remain in Measuring Performance and Ensuring Sustainability	May 23, 2019	2	The Secretary of Commerce should direct the NIST Director to work with other sponsoring federal agencies to ensure that the Manufacturing USA network-wide performance measures are directly aligned with the network-wide performance goals, the Manufacturing USA strategic objectives and program goals, and the statutory purposes of the RAMI Act.	January 2021	Yes	
19-409	Advanced Manufacturing: Innovation Institutes Have Demonstrated Initial Accomplishments, but Challenges Remain in Measuring Performance and Ensuring Sustainability	May 23, 2019	3	The Secretary of Commerce should direct the NIST Director to develop criteria to evaluate whether the Commerce-sponsored institute can sustain its operations without additional federal financial assistance after its initial agreement. If an analysis based on such criteria indicates that additional federal financial assistance is needed to help the institute sustain its operations, then the Secretary of Commerce should consider a legislative proposal to amend relevant provisions of the RAMI Act.	January 2021	Yes	

Recommendations designated by GAO as “Closed-Unimplemented for the past 5 years (2015-2019). Future reports will cover a one-year period.

Report Number	None
Report Title	
Issue Date	
Recommendation Number	
Recommendation	
Reason Not Implemented	

Section 3. Implementation of OIG public recommendations issued no less than one year for which Final Action has not been Taken or Action Not Recommended has been Taken

Report Number	None
Report Title	
Issue Date	
Recommendation Number	
Recommendation	
Target Implementation Date	
Reason No Final Action Taken or Action Not Recommended Taken	
Closure Request Pending	

Section 4. Discrepancies between this report and the semiannual reports submitted by the Commerce Office of Inspector General or reports submitted by the GAO

Report Number	None
Report Title	
Issue Date	
Recommendation Number	
Recommendation	
Discrepancy	
Reason for Discrepancy	

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Overview of Bureau Accomplishments

A full list of NIST's accomplishments can be found in Exhibit 12 for the NIST Laboratory Programs.

SO 1.2

Quantum Information Science: To enable the U.S. to fully capture the benefits of the transformational opportunity offered by quantum science and technology, NIST established the Quantum Economic Development Consortium (QED-C) in partnership with SRI International. Over 200 signed letters of intent to participate in QED-C have been received, ranging from large corporations such as IBM and AT&T to the companies developing the emerging technology applications such as Rigetti and IonQ. The QED-C will support precompetitive R&D such as quantum device design and prototyping; coordinate public and private investments; determine workforce needs; and build out the research infrastructure needed to grow this industry. NIST held a QED-C workshop in November 2019 to assess community needs and develop a roadmap for cryogenic technologies to accelerate quantum information sciences R&D and commercialization. The Quantum Foundry initiative at UC Santa Barbara hosted a QED-C workshop on *Materials Defects and Losses in Superconducting Qubits* in January 2020.

NIST also established a Quantum Network Grand Challenge to develop a simplified Quantum Network to identify and understand classical and quantum bottlenecks. NIST's Nobel Prize winning group led by David Wineland initiated a project to demonstrate a potentially compact scalable quantum repeater, one of the roadblocks to quantum networks. NIST also initiated an effort to demonstrate a compact optical clock that could provide a backup to GPS. NIST participated in a multi-agency Quantum Networking Coordination meeting in May 2020 to discuss long-term goals; a 5-year plan; areas of opportunity; and the status of a roadmap.

Artificial Intelligence (AI) Standards and Trustworthiness: In response to Executive Order 13859 (February 2019), NIST released a report in August of 2019, *U.S. Leadership in AI: A Plan for Federal Engagement in Developing Technical Standards and Related Tools* that 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. Building on this report, NIST is focused on developing a shared understanding of what constitutes trustworthy AI and establishing the scientific foundation for design, development, and assessment of trustworthy AI. NIST hosted a virtual workshop on August 18, 2020, to develop a shared understanding of bias in AI, bringing together experts from the public and private sectors to engage in a series of collaborative discussions about bias in AI. A NIST report on AI bias, detailing a taxonomy of concepts and defining terminology in the field of AI bias and based in part on the August workshop, will be released for public comment later this year. Additionally, in October 2019, NIST released a draft report defining terms and concepts in one area of AI application entitled *A Taxonomy and Terminology of Adversarial Machine Learning*. This report underwent a comment period in early 2020; the second draft for public comment was expected in FY 2020.

Advanced Manufacturing: NIST's research labs and extramural programs continue to advance the frontiers of U.S. manufacturing. NIST provides technical support to the Nation's manufacturing industries as they strive to out innovate and outperform the international competition. For more details on NIST's involvement in advanced manufacturing visit https://www.nist.gov/manufacturing.

In 2020, NIST scientists developed a new method of 3D-printing gels and other soft materials. Some future structures made with this approach could include flexible injectable electrodes to monitor brain activity; biosensors for virus detection; soft micro-robots; and structures that can emulate and interact with living cells and provide a medium for their growth.

SO 3.2

Cybersecurity and Privacy: The popular NIST Framework for Improving Critical Infrastructure Cybersecurity, more widely known as the Cybersecurity Framework, turned six years old. The Framework has been downloaded over half a million times since its release in 2014. Two NIST reports that expand on the Framework closed public comment periods in May 2020 (*Integrating Cybersecurity and Enterprise Risk Management (ERM)* and the *Cybersecurity Framework Version 1.1 Manufacturing Profile*) and the *Approaches for Federal Agencies to Use the Cybersecurity Framework* report was published in March 2020.

Working with stakeholders, NIST used the Cybersecurity Framework to develop a position, navigation, and timing (PNT) profile that will help agencies and industry to identify systems, networks, and assets dependent on PNT services; identify appropriate PNT services; detect the disruption and manipulation of PNT services; and manage the associated risks to the systems, networks, and assets dependent on PNT services. This profile will help organizations make deliberate, risk-informed decisions on their use of PNT services.

Building on the success of the Cybersecurity Framework, the *NIST Privacy Framework: A Tool for Improving Privacy through Enterprise Risk Management Version 1.0* was released in January 2020 after a series of stakeholder events to gather input and a public comment period on the initial draft. The Privacy Framework is a voluntary tool for organizations to better identify, assess, manage and communicate about privacy risks and Version 1.0 provides clarification about privacy risk management concepts and the relationship between the Privacy Framework and NIST's Cybersecurity Framework. In addition, a report about understanding and mitigating security concerns around the Internet of Things (IoT) was published in May 2020 (*Foundational Cybersecurity Activities for IoT Device Manufacturers*) as a follow-up to a previous report that outlined security concerns for IoT devices.

In September 2020, NIST published *Special Publication (SP) 800-53, Revision 5, Security and Privacy Controls for Information Systems and Organizations*, which represents a multi-year effort to develop the next generation of security and privacy controls needed to strengthen and support the Federal Government and every sector of critical infrastructure. In addition, NIST's Cryptographic Module Validation Program (CMVP) in collaboration with the Canadian Centre for Cyber Security begins validating cryptographic modules to Federal Information Processing Standard (FIPS) 140-3, *Security Requirements for Cryptographic Modules*.

Planned Actions for FY 2022

Significant progress has been made on all strategies over the past year and all strategies are on track. NIST does not see any changes needed to be made to the strategies detailed in the FY 2018 – FY 2022 Strategic Plan.

New/emerging internal and external factors that will impact bureau's progress on SOs:
A major internal factor that will impact NIST's progress on SOs is a backlog of over $830 million in deferred maintenance of NIST's infrastructure. Currently 57 percent of NIST Gaithersburg facilities are in poor or critical condition per DOC standards.

Operations at reduced occupancy levels for the NIST research facilities (currently around 25 percent) and maximum telework due to COVID-19 pandemic will have an impact on the research productivity of the Institute as well as the research community that relies on NIST for measurement services. NIST Center for Neutron Research and Center for Nanoscale Science and Technology have been operating on a limited bases for internal and mail-in experiments since March 2020. However, NIST's researchers have been productive in meeting deliverables and making progress on critical projects. Some positive outcomes have been an increase in scientific papers and new data sets. For example, the average number of approved papers increased from 30 per week to about 50 per week during April-June 2020. NIST also published 70 percent more datasets during Q3 of FY 2020 compared to pre-quarantine Q2 of FY 2020.

High-level plans to continue what is working:
NIST continually seeks ways to maximize the relevance and quality of its scientific research and the dissemination of those results. To ensure achievement of its targets, NIST will continue to:

- Support research efforts to apply fundamental physics to measurement and development of practical Quantum International System of Units devices, and dissemination of those technologies;
- Work with stakeholders across its programs to ensure NIST's research programs and capabilities are well-matched to their needs;
- Improve the efficiency and effectiveness of operations and facilities supporting its scientific research;
- Continue to coordinate and strengthen U.S. engagement in critical international standards development activities;
- Support the Manufacturing USA Program by overseeing the planning, management, coordination, and congressional reporting of the Program; and
- Focus National Cybersecurity Center of Excellence on projects that address cybersecurity challenges and technology gaps, impacting businesses, organizations, and industry sectors.

Analysis of Performance Indicators

To ensure performance indicators are aligned with national needs, NIST continually collects information on major national issues, shifting trends in science and technology, and the performance of internal operational processes through a variety of mechanisms including meetings, workshops, industry visits, external advisory boards, and annual independent peer review of its programs. This input is viewed in the context of the NIST mission to make decisions on where NIST needs to develop specific capabilities; how to best marshal existing resources to address current issues; and how to continually optimize the organization for improved performance.

To track progress, NIST works with its standing advisory bodies, including the Visiting Committee on Advanced Technology and other program-specific advisory committees. NIST labs undergo periodic assessments by the National Academies of Sciences, Engineering, and Medicine to ensure NIST is addressing the Nation's most pressing issues and with the highest-quality work.

Explanation of Trends
In FY 2019, NIST exceeded performance targets for SO 1.2 and 3.2. This demonstrates the relevance of NIST scientific work to the industry and research community at large. Performance indicators track two types of metrics: impact factors and the willingness of industry to partner or co-invest with NIST. For instance, the performance indicators that track impact factors look at how NIST research benefits the development of new products and services; and the extent to which it produces relevant scientific and technical publications. Indicators that look at co-investments, demonstrate the value that NIST brings to its partners.

In FY 2020, NIST received a $48.5 million increase above FY 2019 levels, which allowed the Institute to fully fund all its programs and exceed the targets set for this fiscal year.

Explanation of Targets for FY 2021 and FY 2022
NIST continues to prioritize and expand research in the areas relevant to the SO 1.2 – AI, advanced manufacturing, advanced communications, and spectrum sharing; however, the performance indicators for SO 1.2 are looking across all of NIST's programs. The proposed targets for some indicators are set at FY 2020 levels to account for the relatively flat funding levels in FY2021 and the potential impacts of the pandemic.

NIST is planning for steady funding for ongoing work in the area of cybersecurity and privacy, as a result the Institute does not see any expected impacts to the targets for SO 3.2 in FY 2021 and FY 2022.

Progression of the Performance Indicators
Performance indicators rely on the information that is tracked by specific units within NIST. This information is used for accounting and reporting purposes and, in most cases, has designated staff who are responsible for collecting, ensuring accuracy, and monitoring the data. The data serves as an indicator of the overall performance and 'health' of the designated function.

Performance Data Validation and Verification
NIST uses established processes to ensure accuracy and reliability of the data used to measure progress toward achieving the SOs. The data is collected and retained in databases, which are maintained at the individual unit level. To automate and streamline the collection of this data, NIST could benefit by additional resources to incorporate Robotic Process Automation into regular workflows.

Department of Commerce
National Technical Information Service
NTIS Revolving Fund
Budget Estimates, Fiscal Year 2022
Congressional Submission

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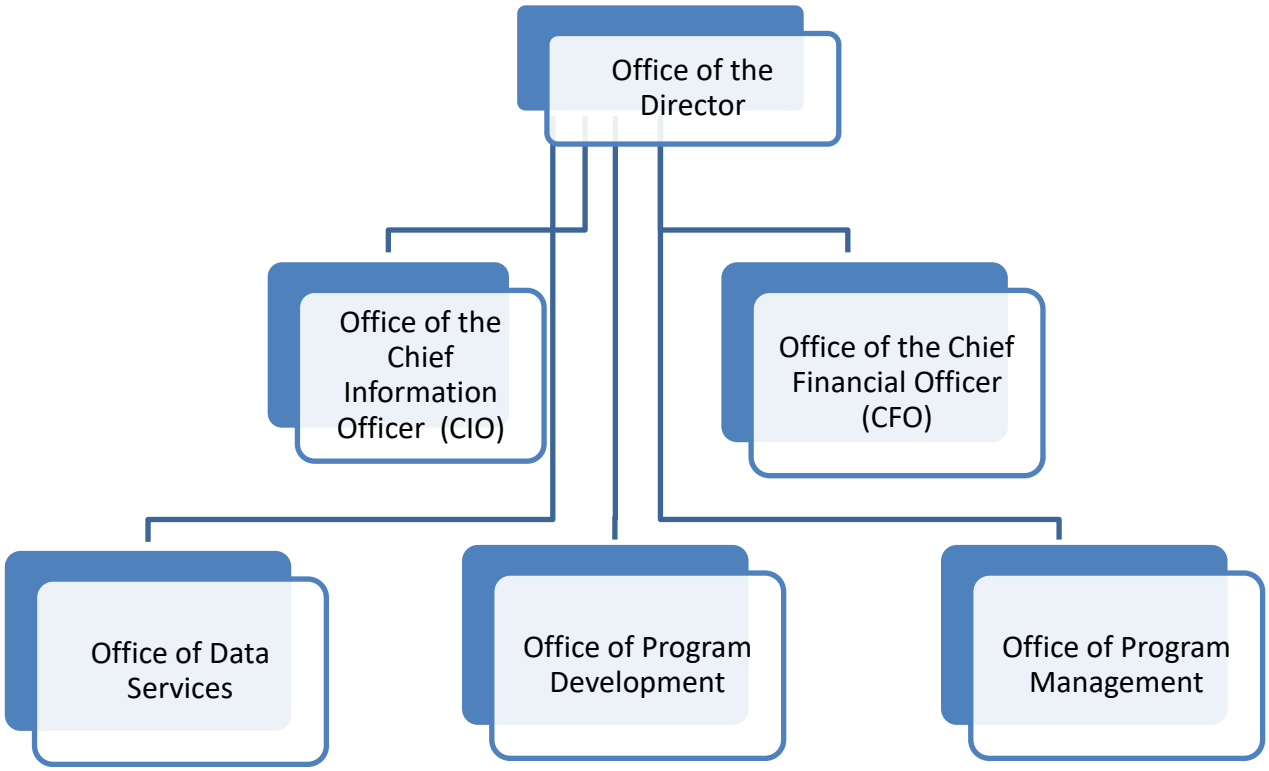
U.S Department of Commerce
National Technical Information Service



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Department of Commerce
National Technical Information Service
NTIS Revolving Fund
Budget Estimates, Fiscal Year 2022

Executive Summary

National Technical Information Service (NTIS) supports the entire data delivery pipeline for creating unique platforms to access, analyze, and use data; combining data in new ways to enable innovative products and services; and delivering better data services to businesses, communities, and citizens. NTIS provides services using modern data science, engineering, and best practices which are essential to rapidly executing projects requiring high levels of innovation and creativity. NTIS is a self-supporting agency without federal discretionary appropriations and recovers its operating costs from fees and the use of its Public Enterprise Revolving Fund.

NTIS provides data services within four key elements:

- Data Discovery and Usability (e.g., data cataloging and inventories, data capture and storage, search engine optimization, interactive query management, customer analytics, user experience design of data portals, usability testing, user analytics).
- Data Interoperability and Standards (e.g., user interfaces for data portals, data cleansing and standards, metadata practices, developer platforms with suite of application program interface tools).
- Data Analytics and Forecasting (e.g., comparative/predictive data analytics, forecasting, statistical methods, computer science and machine learning methods, geospatial analysis, data visualization).
- Data Infrastructure and Security (e.g., data delivery services for access anytime, anywhere; enterprise data management; data delivery business models; software development life cycle; cybersecurity; cloud-based data solutions; assistive technologies; data collection services).

NTIS leverages its unique capabilities and authorities to partner with the private sector to rapidly execute projects requiring the use of modern data science, engineering, and best practices. Critical to success of these projects is the ability to use advanced software development processes, specifically:

- Agile and collaborative development process to support frequent software releases and risk reduction;
- DevOps process to tightly integrate software development with quality assurance, deployment, and operations while also supporting frequent releases and risk reduction; and,
- Life cycle approach to software development (plan, code, build, test, release, deploy, and operate).

NTIS services include a permanent repository and clearinghouse for scientific, technical, engineering, and business information which includes more than three million publications covering more than 350 subject areas. Today, NTIS receives federal agency reports electronically, attaches robust metadata to these reports and ensures that the documents remain available to the public even if individual agencies remove them from their websites. NTIS's online database also presents this metadata and the full text of reports in a form that enables access across the internet. As a result, scientists, engineers, and other customers looking for federal reports and data get much better results from the search engines than would be possible without NTIS efforts. In addition, NTIS is often the only current source for many reports issued prior to 1995. NTIS received these reports from federal agencies in paper copy and has archived them on microfiche. A Government Accountability Office report (GAO-14-781T) dated July 23, 2014, found that in some subject areas up to 45 percent of the collection of three million publications on more than 350 subjects is exclusively available from NTIS.

As technology has evolved, projects related to online data and services have generated an increasing share of the agency's operating revenues. NTIS strongly supports the Department's commitment to make data easier for business, government, taxpayers, and communities to access, analyze, and use federal data assets. NTIS will evolve, and its service portfolio will continue to grow by supporting the entire data delivery pipeline with a focus on increasing access to data, combining data in new value-added ways, and delivering improved services and products.

Department of Commerce
National Technical Information Service
NTIS Revolving Fund
SUMMARY OF RESOURCE REQUIREMENTS
(Dollar amounts in thousands)

	Positions	FTE	Budget Authority	Direct Obligations
Appropriation Available, 2021	0	0	0	0
Plus 2022 Adjustments to Base	0	0	0	0
Less: Obligations from prior years	0	0	0	0
2022 Base	0	0	0	0
Plus 2022 program changes	0	0	0	0
2022 Estimate	0	0	0	0

		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease over 2022 Base	
Comparison by activity/subactivity:		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
National Technical Information Service											
Organization, Preservation and Public	Pos./BA	0	0	0	0	0	0	0	0	0	0
Access to Technical Information	FTE/Obl.	0	0	0	0	0	0	0	0	0	0
Total	Pos./BA	0	0	0	0	0	0	0	0	0	0
	FTE/Obl.	0	0	0	0	0	0	0	0	0	0
Adjustments for:											
Recoveries		0	0	0	0	0	0	0	0	0	0
Unobligated balance, start of year		0	0	0	0	0	0	0	0	0	0
Unobligated balance transferred		0	0	0	0	0	0	0	0	0	0
Unobligated balance, end of year		0	0	0	0	0	0	0	0	0	0
Unobligated balance expiring		0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0
Financing from transfers:		0	0	0	0	0	0	0	0	0	0
Transfer from other accounts (-)		0	0	0	0	0	0	0	0	0	0
Transfer to other accounts (+)		0	0	0	0	0	0	0	0	0	0
Appropriation		0	0	0	0	0	0	0	0	0	0

Department of Commerce
National Technical Information Service
NTIS Revolving Fund
SUMMARY OF REIMBURSABLE OBLIGATIONS
(Dollar amounts in thousands)

Activity: Information Clearinghouse Program

Line Item		2020 Actual		2021 Enacted		2022 Base		2022 Estimate		Increase/Decrease from 2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
National Technical Information Service:	Pos/Approp	40	0	43	0	43	0	43	0	0	0
Information Clearinghouse Program	FTE/Obl.	40	$67,296	43	$100,000	43	$100,000	43	$100,000	0	0
Total	Pos/Approp	40	0	43	0	43	0	43	0	0	0
	FTE/Obl.	40	67,296	43	100,000	43	100,000	43	100,000	0	0

Department of Commerce
National Technical Information Service
NTIS Revolving Fund
SUMMARY OF FINANCING
(Dollar amounts in thousands)

	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/ Decrease/ from 2022 Base
Total Obligations	67,296	100,000	100,000	100,000	0
Offsetting collections from:					
Federal funds	(72,051)	(95,000)	(95,000)	(95,000)	0
Trust funds	0	0	0	0	0
Non-Federal sources	(5,428)	(5,000)	(5,000)	(5,000)	0
Recoveries	0	0	0	0	0
Unobligated balance, start of year	(26,218)	(24,848)	(24,848)	(24,848)	0
Unobligated balance transferred	0	0	0	0	0
Unobligated balance, end of year	24,848	24,848	24,848	24,848	0
Unobligated balance expiring	0	0	0	0	0
Budget Authority	0	0	0	0	0
Financing:					
Transfer from other accounts (-)	0	0	0	0	0
Transfer to other accounts (+)	0	0	0	0	0
Appropriation	0	0	0	0	0

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Department of Commerce
National Technical Information Service NTIS Revolving Fund
NTIS Revolving Fund
JUSTIFICATION OF PROGRAM AND PERFORMANCE
(Dollar amounts in thousands)

Activity: National Technical Information Service

Goal Statement

The National Technical Information Service (NTIS) promotes the data priorities of the DOC and other federal agencies, including open access, open data, providing information and data services to the public, industry, and other federal agencies in ways that enable American innovation and economic growth. NTIS serves as a center of excellence that delivers trusted data networks through agile partnerships with the private sector which enable new and improved data products and services.

Base Program

NTIS' basic authority is to operate a permanent clearinghouse of scientific and technical information, codified as chapter 23 of Title 15 of the United States Code (15 U.S.C. 1151-1157). This chapter also established NTIS' authority to charge fees for its products and services and to recover all costs through such fees "to the extent feasible".

Statement of Operating Objectives

All activities are funded through the NTIS Revolving Fund, without direct appropriation. NTIS' objectives are to (a) create unique data platforms that make it easier for the public, industry, and other federal agencies to access, analyze, and use data; (b) combine data in new ways to enable the delivery of innovative products and services; and (c) deliver better data services to businesses, communities, and citizens. These objectives are focused on supporting Department and federal data priorities, including open access and open data. This work requires collaborating with federal agencies, partnering with the private sector, delivering modern information and data services, and disseminating federally funded scientific, technical, and related information. NTIS will meet its objectives in the most cost-effective and efficient manner possible while ensuring strong governance and stewardship of its unique mission and authorities.

NTIS released the Public Access National Technical Reports Library on October 1, 2016, permitting the American public free access to the electronic scientific and technical reports in its repository, which collects and catalogues approximately 30,000 scientific and technical reports annually that are added to its permanent collection.

Explanation and Justification

NTIS continues to make substantial progress in improving its service to the public by establishing and maintaining data programs that assist other federal agencies in effectively disseminating information to the American public. A representative set of national data programs that NTIS will continue to provide to the American public includes: NTIS Database and the Social Security Administration Limited Access Death Master File.

Line Item		2020 Actual		2021 Enacted		2022 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
NTIS Revolving Fund	Pos./BA	40		43		43	
	FTE/Obl	40	$67,296	43	$100,000	43	$100,000

Department of Commerce
National Technical Information Service
NTIS Revolving Fund - Reimbursable Obligations
SUMMARY OF REQUIREMENTS BY OBJECT CLASS
(Dollar amounts in thousands)

	Object Class	2020 Actual	2021 Enacted	2022 Base	2022 Estimate	Increase/ Decrease from 2022 Base
11.1	Full-time permanent compensation	$ 5,234	$ 5,325	$ 6,300	$ 6,300	0
11.3	Other than full-time permanent	169	172	175	$ 175	0
11.5	Other personnel compensation	121	125	125	$ 125	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	**Total personnel compensation**	5,524	5,622	6,600	6,600	0
12.1	Civilian personnel benefits	1,638	1,690	1,850	$ 1,850	0
13	Benefits for former personnel	81	0	0	0	0
21	Travel and transportation of persons	4	75	75	$ 75	0
22	Transportation of things	229	250	250	$ 250	0
23	Rent, communications, and utilities	743	750	0	$ -	0
23.1	Rental payments to GSA	636	2,000	2,000	$ 2,000	0
23.2	Rental payments to others	50	50	50	$ 50	0
23.3	Communications, utilities, and misc. charges	0	0	1,800	$ 1,800	0
24	Printing and reproduction	0	4	4	$ 4	0
25	Other contractual services	2,400	0	0	$ -	0
25.1	Advisory and assistance services	0	100	100	$ 100	0
25.2	Other services from non-Federal sources	54,428	82,709	81,521	$ 81,521	0
25.3	Other goods and services from Federal sources	1,900	3,750	3,750	$ 3,750	0
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	0	0	0	0	0
25.7	Operation and maintenance of equipment	1,462	1,500	500	$ 500	0
26	Supplies and materials	154	500	500	$ 500	0
31	Equipment	47	1,000	1,000	$ 1,000	0

Department of Commerce
National Technical Information Service
NTIS Revolving Fund - Reimbursable Obligations
SUMMARY OF REQUIREMENTS BY OBJECT CLASS
(Dollar amounts in thousands)

	Object Class	2020 Actual	2021 Estimate	2022 Base	2022 Estimate	Increase/ Decrease from 2022 Base
32	Land and structures	0	0	0	0	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	0	0	0	0	0
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total Obligations	69,296	100,000	100,000	100,000	0
	Earned Revenue/Reimbursable Obligations	69,296	100,000	100,000	100,000	0
	Total Obligations	69,296	100,000	100,000	100,000	0
	Personnel Data					
	Full-Time Equivalent Employment:					
	Full-time permanent	39	42	42	42	0
	Other than full-time permanent	1	1	1	1	0
	Total	40	43	43	43	0
	Authorized Positions:					
	Full-time permanent	42	42	42	42	0
	Other than full-time permanent	1	1	1	1	0
	Total	43	43	43	43	0

Department of Commerce
National Technical Information Service
NTIS Revolving Fund
APPROPRIATION LANGUAGE AND CODE CITATION

FY 2022

NTIS Revolving Fund

For expenses necessary in the conduct of business of the National Technical Information Service

Specific Code Number: 15 U.S.C 1151 et seq. and 3704b

Department of Commerce
National Technical Information Service
NTIS Revolving Fund
ADVISORY AND ASSISTANCE SERVICES
(Dollar amounts in thousands)

	2020 Actual	2021 Enacted	2022 Estimate
Consulting Services	0	0	0
Management and professional services	0	100	100
Special studies and analysis	0	0	0
Management & Support Services for research and development	0	0	0
Total	0	100	100

Department of Commerce
National Technical Information Service
NTIS Revolving Fund
PERIODICALS, PAMPHLETS, AND AUDIOVISUAL PRODUCTS
(Dollar amounts in thousands)

	2020 Actual	2021 Enacted	2022 Estimate
Periodicals	-	-	-
Pamphlets	-	-	-
Audiovisuals	-	-	-
Total	-	-	-

Department of Commerce
National Technical Information Service
NTIS Revolving Fund
AVERAGE GRADE AND SALARIES
(Dollar amounts in thousands)

	2020 Actual	2021 Estimate	2022 Estimate
Average GS/GM Grade	13	13	13
Average GS/GM Salary	122,408.00	123,198.00	126,620.00

Department of Commerce
National Technical Information Service
NTIS Revolving Fund
IMPLEMENTATION STATUS OF GAO AND OIG RECOMMENDATIONS

31 U.S.C. 720, as amended January 3, 2019, requires the head of a federal agency to submit a written statement of the actions taken or planned on Government Accountability Office (GAO) recommendations to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 180 calendar days after the date of the report.

The Good Accounting Obligation in Government Act (GAO-IG Act), passed on January 3, 2019, (P.L. 115-414) requires each agency to include, in its annual budget justification, a report that identifies each public recommendation issued by GAO and the agency's office of the inspector general (OIG) which has remained unimplemented for one year or more from the annual budget justification submission date. In addition, the Act requires a reconciliation between the agency records and the IGs' Semiannual Report to Congress (SAR).

Section 1. Recommendations for which action plans were finalized since the last appropriations request.
Nothing to Report

Section 2. Implementation of GAO public recommendations issued no less than one year ago that are designated by GAO as 'Open' or 'Closed-Unimplemented.'
Nothing to Report

Section 3. Implementation of OIG public recommendations issued no less than one year for which Final Action has not been Taken or Action Not Recommended has been Taken
Nothing to Report

Section 4. Discrepancies between this report and the semiannual reports submitted by the Commerce Office of Inspector General or reports submitted by the GAO
Nothing to Report

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ANNUAL PERFORMANCE PLAN/REPORT (APPR) BACKUP
NATIONAL TECHNICAL INFORMATION SERVICE

1) Summary

i) Overview

The National Technical Information Service (NTIS) helps federal agencies make better decisions about data, with data. We provide the support and structure that helps our partners securely store, analyze, sort, and aggregate data in new ways. We use our private-sector partners' knowledge to create new ways of using data to solve problems. Our Joint Venture program works side-by-side with universities, nonprofits and industry professionals — together, they can experiment with data science technologies before they're available in the marketplace.

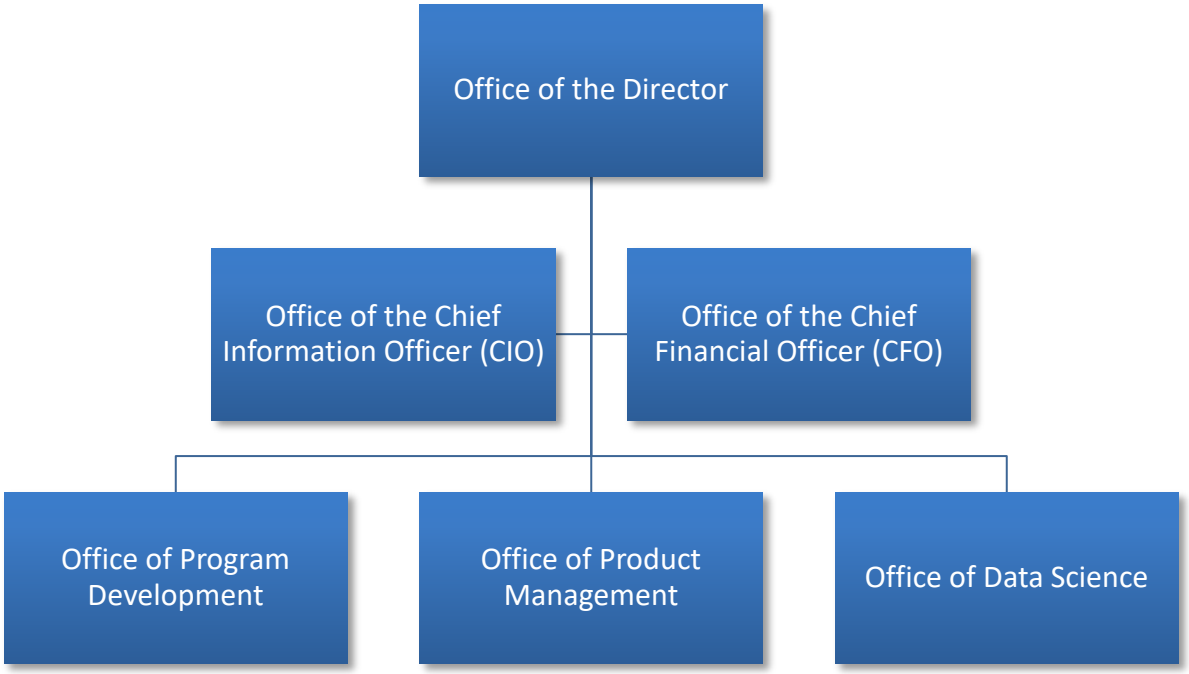
ii) Mission statement

The National Technical Information Service (NTIS) promotes the data priorities of the Department of Commerce (DOC) and other Federal agencies, including open access, open data, providing information and data services to the public, industry, and other federal agencies in ways that enable American innovation and economic growth. NTIS serves as a center of excellence that delivers trusted data science solutions through partnerships with the private sector, which enable new and improved data products and services.

iii) Organizational structure

NTIS is a fee-based, self-supporting agency without direct Federal appropriations, with five major organizational units.

Organization Chart



iv) Cross-Agency Priority (CAP) Goals

Leveraging Data as a Strategic Asset (CAP Goal 2)

NTIS's data-centric mission has contributed to Cross-Agency Priority Goal 2, Leveraging Data as a Strategic Asset, by helping Federal programs scale their capacity quickly through NTIS's joint venture partners who include some of the brightest data science minds in the nation.

- At HHS OIG, NTIS partnered in a multi-year effort to enhance the OIG's ability to protect the integrity of HHS programs as well as the health and welfare of program beneficiaries, which involves over a one trillion-dollar portfolio.

- NTIS will continue to work alongside the Department of Defense Joint AI Center (JAIC) to provide data driven services with its joint venture partners to assist the JAIC in scaling their capabilities. NTIS is supporting four separate mission areas of the JAIC:
    - Infrastructure – addresses how AI will be monitored for security (for example, machine learning solutions that self-evolve), and provide a series of common platforms that will accelerate future AI work. NTIS is assisting in:
        - Establishment of an initial data services capability to support accessing DoD data across multiple networks.
        - Providing Cyber Security Support for AI/ML Security and Domain Networking Extensions.
    - Intelligent Business Automation (IBA) – addresses how DoD Systems and processes for business and warfighter decisions can become more efficient and effective with the assistance of AI. NTIS continues to assist the JAIC with understanding the business needs of the DoD community for IBA and providing a high-level conceptual framework for meeting those needs.
    - Cyber sensing – addresses how AI can augment cybersecurity within the DoD Information Network and cyberspace operations. NTIS continues to assist the JAIC in understanding the high-level requirements and helping address multiple facets of applying AI to problems such as enhanced network discovery and user activity monitoring.
    - Joint Warfighting – addresses how to leverage AI to enhance the use of systems in an operational setting to improve combat operations. NTIS continues to assist the JAIC in assessing at a high level how to address this mission space.

- NTIS will continue to support FDA's Center for Drug Evaluation and Research (CDER) to improve bioresearch monitoring compliance using data analytics and automation to enhance effectiveness of drug site assessments. NTIS will continue to partner with the VA OIG to develop a predictive data analytics and modeling program to predict potential fraud and address systemic issues across the VA ecosystem.

- At OPM, NTIS is working with the USAJOBS team to improve job alignment and the candidate selection processes for the Federal civilian workforce.

v) Strategic Goal(s) and Objective(s)

Goal 1 – Accelerate American Leadership
Strategic Objective 1.2 – Advance Innovation

- The President's Management Agenda (PMA), as cited in OMB's Memorandum (M-18-23), prioritizes reducing the burden of low-value activities and redirecting resources to accomplishing mission outcomes that matter most to citizens. As a Fed-to-Fed advisor involving data science, NTIS will continue contributing to these reforms by designing innovative data science solutions, which not only harness private-sector expertise, but often by introducing highly efficient, scalable capabilities.

- NTIS will deliver these high-value solutions by working closely with both private-sector partners and other Federal Agencies to streamline data access and interoperability, leverage new technologies, launch shared service platforms, and incorporate process automation technologies.

- Moreover, NTIS will advance Federal data priorities through efficient data structures: combining data from disparate sources; migrating siloed, legacy Federal data; and improving data interoperability, and through effective data-insights: delivering data-insights, analytical tools, and evidence-based reporting capabilities that inform program management, fiscal planning, policy oversight, and mission outcomes.

- NTIS will improve citizen services; reduce fraud, waste, and abuse; and maximize return on taxpayer investments via efficient Federal data-driven services.

These innovative data-centric accomplishments will be achieved through partnerships with the private-sector, which leverages their cutting-edge data expertise, to help Federal programs accomplish mission outcomes.

vii) Progress update for Strategic Objectives

Also, in FY 2019, NTIS continued to divest from its older mission activities and transitioned to mission priorities using its joint venture authority. NTIS expanded lines of effort focused on making data more accessible to blind veterans. Additionally, NTIS executed a reorganization that took effect in FY 2019.

viii) Planned Actions for Achieving Strategic Objectives and FY 2021 Performance

Increased outreach across the Federal Government. Expand current market penetration in existing Federal client accounts. Develop partnership with GSA.

2) Summary of Performance

In FY 2019, NTIS reported results on 3 of 3 performance indicators. Of those indicators, NTIS met the target for two of the three indicators, but did not meet the target the remaining one. All three indicators have a positive trend.

3) Detailed Indicator Plans and Performance

Strategic Goal	**Accelerate American Leadership**							
Objective #	1.2 Advance Innovation							
Indicator	Number of new public-private projects (or Government – Industry projects) entered into under the Joint Venture (JV) Authority per year							
Category	Supporting							
Type	Output							
Description	The indicator measures the number of new projects between NTIS' Joint Venture Partners (JVPs) and Federal, State, and Local Agencies that were facilitated by NTIS in a given year. (see Notes)							
	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
Target					5	5	10	15
Actual					10	15	13	
Status					Exceeded	Exceeded	Exceeded	

Trend	
Action(s) to achieve FY 2022 target	Increase outreach to Federal Government Agencies.
Notes	(continued from Description) These public-private projects show the trend of both investments in technology development and building new connections throughout the supply chain. NTIS delivers benefit to the public by advancing Federal data priorities, promoting economic growth, and enabling operational excellence.
Information Gaps	Preliminary target based on current project activities
Reason for new indicator	N/A
Indicator(s) being replaced	N/A

Strategic Goal	**Enhance Job Creation**							
Objective #	2.2 Reduce and Streamline Regulations							
Indicator	Yearly average number of days required to complete public-private projects (or Government – Industry projects) entered into under the Joint Venture (JV) Authority							
Category	Supporting							
Type	Output							
Description	The indicator measures the average number of days required by NTIS to fully execute the agreements on a per project basis between NTIS' Joint Venture Partners (JVPs) and Federal, State, and Local Agencies on a yearly basis. (see Notes)							
	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
Target					120	110	100	90
Actual					157	126	32	
Status					Not Met	Not Met	Exceeded	
Trend	Increasing towards meeting targets.							

Action(s) to achieve FY 2022 target	Introduction to automated workflows, develop reusable templates, and standardized package offerings incorporating terms of service agreements.
Notes	(continued from Description) The lower the number of days required to fully execute a Joint Venture Authority agreement between NTIS, its' Joint Venture Partners, and Federal, State, and Local Agencies, the more investments made by the Federal Government in technology.
Information Gaps	Preliminary target based on current project activities
Reason for new indicator	N/A
Indicator(s) being replaced	N/A

Strategic Goal	**Enhance Job Creation**							
Objective #	2.3 Strengthen Domestic Commerce and the U.S. Industrial Base							
Indicator	Total investment by the Federal Government on new public-private projects (or Government – Industry projects) entered into under the Joint Venture (JV) Authority per year							
Category	Supporting							
Type	Output							
Description	The indicator measures the value, in U.S. Dollars, of all new project agreements between NTIS' Joint Venture Partners (JVPs) and Federal Agencies facilitated by NTIS in a given year. (See Notes)							
	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
Target					$ 2.5M	$ 3.0M	$ 10.0M	$ 20.0M
Actual					$ 9.2M	$ 34.8M	$22.8	
Status					Exceeded	Exceeded	Exceeded	
Trend	Increasing							
Action(s) to achieve FY 2022 target	Increase Data Science Data Portfolio based on Joint Venture Authority.							

Notes	(continued from Description) By tracking the obligated values, this indicator shows the actual Federal Government investment in technology and data analytics development.
Information Gaps	None
Reason for new indicator	N/A
Indicator(s) being replaced	N/A