NATIONAL INSTITUTE
OF STANDARDS AND TECHNOLOGY

NATIONAL TECHNICAL INFORMATION SERVICE

FISCAL YEAR 2021
BUDGET SUBMISSION TO CONGRESS

DEPARTMENT OF COMMERCE
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
Budget Estimates, Fiscal Year 2021
Congressional Submission

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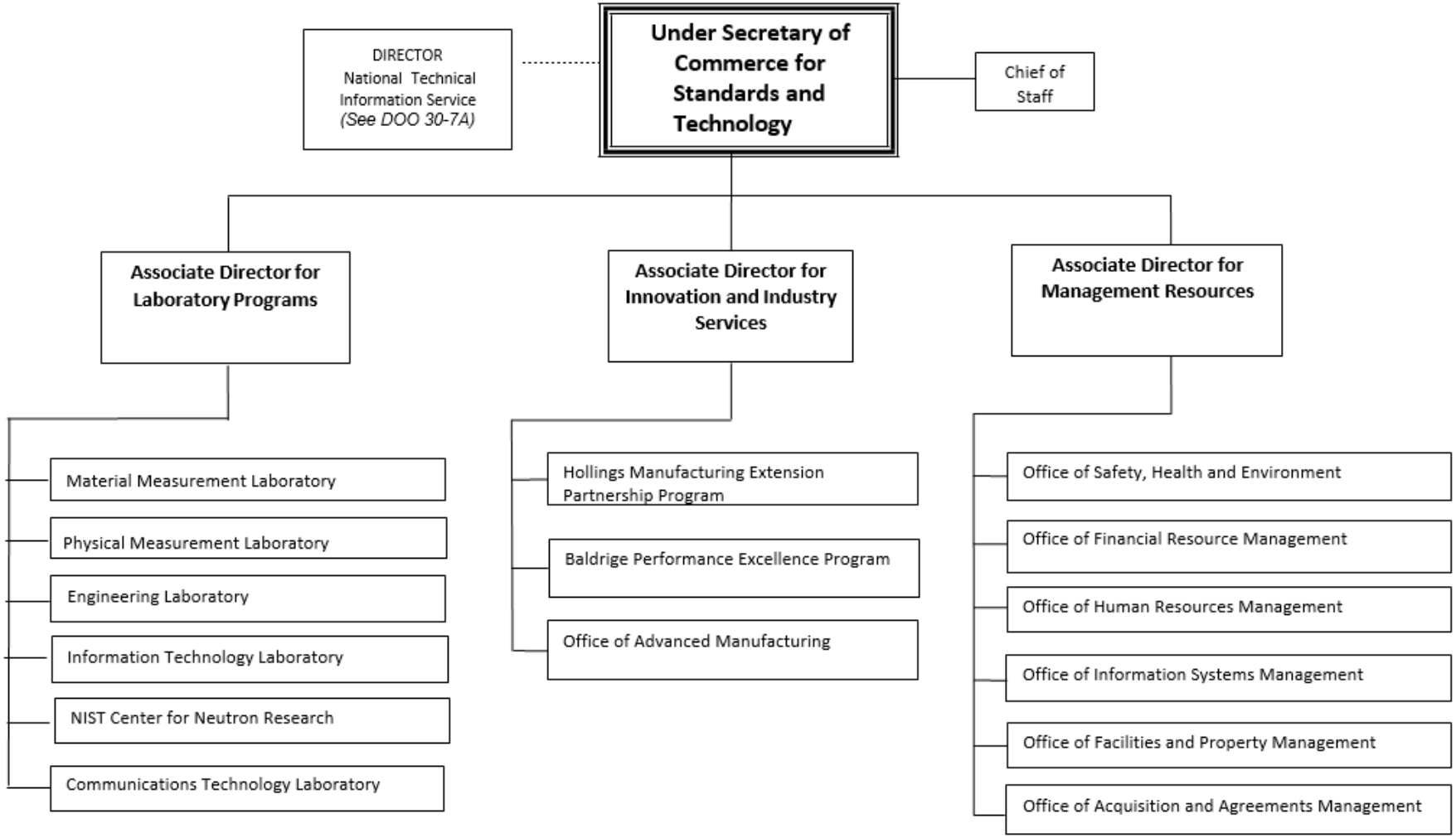
Exhibit 2

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



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Department of Commerce
National Institute of Standards and Technology
Budget Estimates, Fiscal Year 2021

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 in ways that enhance economic security and improve 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. For over 115 years, NIST has maintained the national standards of measurement, a role the U.S. Constitution assigns to the federal government to ensure fairness in the marketplace. NIST was founded in 1901 and is one of the Nation's oldest physical science laboratories.

The FY 2021 NIST budget request is $737.5 million, a reduction of $296.5 million or 28.6 percent and 479 positions from the FY 2020 enacted level. Significant reductions in FY 2021 include: $136.7 million and 81 positions in the Industrial Technology Services (ITS) appropriation (including the proposed elimination of the Hollings Manufacturing Extension Partnership Program (MEP)), $102 million and 398 positions in the Scientific and Technical Research and Services (STRS) appropriation, and $57.8 million in the Construction of Research Facilities (CRF) appropriation.

The FY 2021 discretionary budget request for NIST includes three appropriations.

1. Scientific and Technical Research and Services: The FY 2021 budget request for STRS is $652 million, a reduction of $102 million or 13.5 percent and 398 positions from the FY 2020 enacted level. 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. NIST Laboratories address increasingly complex measurement challenges, ranging from the very small (quantum devices for sensing and advanced computing) to the very large (vehicles and buildings), and from physical to virtual infrastructure (cybersecurity and the internet of things). As new technologies develop and evolve, NIST measurement research and services remain critical to national defense, homeland security, trade, and innovation. Within the request levels, the budget includes $27.4 million for new efforts for a Measurement Tools and Testbeds to Power the Industries of the Future initiative.

2. Industrial Technology Services: The FY 2021 budget request for ITS is $25.3 million, a reduction of $136.7 million or 84 percent and 81 positions from the FY 2020 enacted level. The request funds the Manufacturing USA program. Manufacturing USA, previously referred to as the National Network for Manufacturing Innovation, serves to create effective robust manufacturing research infrastructure for U.S. industry and academia to solve industry-relevant problems.

The Manufacturing USA program consists of linked Institutes for manufacturing innovation with common goals, but unique concentrations. In each Institute, industry, academia, and government partners leverage existing resources, collaborate, and co-invest to nurture manufacturing innovation and to accelerate commercialization. The budget proposes to initiate a second NIST-funded Manufacturing USA institute while discontinuing dedicated Federal funding to the first institute, as well as the coordination of the Manufacturing USA network. Federal funding for the Hollings Manufacturing Extension Partnership Program (MEP) is eliminated.

3. Construction of Research Facilities: The FY 2021 budget request for CRF is $60.2 million, a reduction of $57.8 million or 49 percent from the FY 2020 enacted level. The request provides funds for basic maintenance of current NIST facilities. In addition, the FY 2021 budget request proposes: (1) to create a Federal Capital Revolving Fund (FCRF) to fund large-dollar, federally-owned, civilian real property capital projects; and (2) to provide specific budget enforcement rules for the FCRF that would allow it to function, in effect, like State and local government capital budgets. The FCRF will be housed in the General Services Administration (GSA). This proposal incorporates principles that are central to the success of capital budgeting at the State and local level: a limit on total funding for capital investment, annual decisions on the allocation of funding for capital projects and spreading the acquisition cost over 15 years in the discretionary operating budgets of agencies that purchase the assets.

   The FY 2021 budget request proposes to use the FCRF to fund the completion of the $294 million renovation of NIST Building One in Boulder, Colorado. In accordance with the principles and design of the FCRF, the FY 2021 budget requests appropriations language designating the renovation as a project to be funded out of the FCRF along with 1/15 of the renovation costs, or $19.6 million, for the first-year repayment back to the FCRF.

   As directed in Senate Report 115-275, NIST awarded a contract to develop a 20-year implementation plan for the Gaithersburg and Boulder master plans. The implementation plan is projected to be finalized in late FY 2020. In the interim, NIST will provide progress updates on plan development.

   Technical Transfer: The Department of Commerce (DOC) is proposing to transfer nine 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 Department of Commerce please refer to Exhibit 3 of the Departmental Management FY 2021 Congressional Justification Budget.

Appropriation	(Dollar amounts in millions) FY 2020 Enacted		FY 2021 Request		Change from FY 2020 Enacted Level	
	Positions	Amount	Positions	Amount	Positions	Amount
Scientific and Technical Research and Services	2,586	$754.0	2,188	$652.0	(398)	($102.0)
Industrial Technology Services	99	$162.0	18	$25.3	(81)	($136.7)
Construction of Research Facilities	116	$118.0	116	$60.2	0	($57.8)
Working Capital Fund	686	$0.0	686	$0.0	0	$0.0
TOTAL DISCRETIONARY RESOURCES	**3,487**	**$1,034.0**	**3,008**	**$737.5**	**(479)**	**($296.5)**

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 Departmental Management Salary and Expenses

	Object Class	2020 Enacted	2021 Transfer	2021 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	0	($907)	($907)
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	0	(907)	(907)

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 Departmental Management Salary and Expenses

	Object Class	2020 Enacted	2021 Transfer	2021 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	0	($11)	($11)
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	0	(11)	(11)

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 Departmental Management Salary and Expenses

	Object Class	2020 Enacted	2021 Transfer	2021 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	0	($80)	($80)
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	0	(80)	(80)

Department of Commerce
National Institute of Standards and Technology
FY 2021 PROGRAM INCREASES / DECREASES / TERMINATIONS
(Dollar amounts in thousands)

Increases

Page No. in CJ	Appropriations	Budget Program	Title of Increase	Positions	Budget Authority
NIST – 37	STRS	Laboratory Programs	Measurement Tools and Testbeds to Power the Industries of the Future (IoTF)	24	$27,415
NIST – 116	CRF	Construction and Major Renovations	GSA Federal Capital Revolving Fund Annual Payments Increase	0	$19,600
NIST – 89	ITS	Manufacturing USA	Fund an Additional DOC Manufacturing USA Institute	0	$9,068
Subtotal, Increases				24	$56,083

Decreases

Page No. in CJ	Appropriations	Budget Program	Title of Decrease	Positions	Budget Authority
NIST – 31	STRS	Laboratory Programs	Laboratory Programs Reduction	(391)	($115,461)
NIST – 120	CRF	Construction and Major Renovations	Building One Renovation Decrease	0	($43,000)
NIST – 118	CRF	Construction and Major Renovations	Safety, Capacity, Maintenance and Major Repairs Reduction	0	($36,536)

NIST – 57	STRS	Standards Coordination and Special Programs	Standards Coordination and Special Programs Reduction	(25)	($34,366)
NIST – 46	STRS	Corporate Services	Corporate Services Programmatic Decrease	(6)	($5,802)
Subtotal, Decreases				(422)	($235,165)

Terminations

Page No. in CJ	Appropriations	Budget Program	Title of Termination	Positions	Budget Authority
NIST – 82	ITS	Hollings Manufacturing Extension Partnership Program	Hollings Manufacturing Extension Partnership Program	(81)	($146,853)
Subtotal, Decreases				(81)	($146,853)

Department of Commerce
National Institute of Standards and Technology
FY 2021 TRANSFER SUMMARY TABLE
(Dollar amounts in thousands)

Page No In CJ	Budget Program	Appropriations	Title of Transfer	Positions	Budget Authority
NIST – 17	NIST	STRS	Transfer to Departmental Management Salary and Expenses	0	($998)
		Total, Transfers		0	(998)

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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, 2020	2,586	2,486	$757,000	$773,980	$754,000
Less: Unobligated balance from prior year	0	0	0	(16,980)	0
Less: Transfer from DoJ	0	0	(1,500)	(1,500)	0
Less: Transfer from EAC	0	0	(1,500)	(1,500)	0
2021 Adjustments to base:					
Annualization of positions financed in FY 2020	0	6			
Plus: Inflationary adjustments to base	0	0	26,241	26,241	26,241
2021 Base Request	2,586	2,492	780,241	780,241	780,241
Less: 2021 Program changes	(398)	(404)	(128,214)	(128,214)	(128,214)
Plus: Transfer from DoJ	0	0	1,500	1,500	0
Plus: Transfer from EAC	0	0	1,250	1,250	0
2021 Estimate	2,188	2,088	654,777	654,777	652,027

Comparison by activity/subactivity with totals by activity		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease over 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Measurement Science, Services, and Programs											
Laboratory Programs	Pos./Approp	2,320	$628,131	2,346	$655,767	2,346	$679,378	1,979	$591,332	(367)	($88,046)
	FTE/Obl.	2,157	640,846	2,257	669,506	2,263	679,378	1,890	592,582	(373)	(86,796)
Corporate Services	Pos./Approp	29	17,300	29	17,311	29	17,762	23	11,960	(6)	(5,802)
	FTE/Obl.	27	17,322	28	17,315	28	17,762	22	11,960	(6)	(5,802)
Standards Coordination and Special Programs	Pos./Approp	208	79,069	211	80,922	211	83,101	186	48,735	(25)	(34,366)
	FTE/Obl.	193	88,671	201	87,159	201	83,101	176	50,235	(25)	(32,866)
TOTALS	Pos./Approp	2,557	724,500	2,586	754,000	2,586	780,241	2,188	652,027	(398)	(128,214)
	FTE/Obl.	2,377	746,839	2,486	773,980	2,492	780,241	2,088	654,777	(404)	(125,464)

Exhibit 5

	2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease over 2021 Base	
	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Adjustments for:										
Recoveries		(7,043)		0		0		0		0
Refunds		(47)		0		0		0		0
Unobligated balance, start of year		($29,485)		(16,980)		0		0		0
Unobligated balance, end of year		16,980		0		0		0		0
Unobligated balance, expired account		6		0		0		0		0
Budget Authority		727,250		$757,000		$780,241		$654,777		($125,464)
Financing from transfers:										
Transfers from DoJ for OLES (-)		(1,500)		(1,500)		0		(1,500)		(1,500)
Transfer from Election Assistance Commission (-)		(1,250)		(1,500)		0		(1,250)		(1,250)
Appropriation		724,500		754,000		780,241		652,027		(128,214)

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

Comparison by activity/subactivity	2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease from 2021 Base	
	FTE	Amount	FTE	Amount	FTE	Amount	FTE	Amount	FTE	Amount
Measurement Science, Services, and Programs										
Laboratory Programs	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0

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

	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
Total Obligations	$746,839	$773,980	$780,241	$654,777	($125,464)
Offsetting collections from:					
Federal funds	0	0	0	0	0
Non-Federal sources	0	0	0	0	0
Total offsetting collections	0	0	0	0	0
Adjustments for:					
Recoveries and refunds	(7,090)	0	0	0	0
Unobligated balance, start of year	(29,485)	(16,980)	0	0	0
Unobligated balance, end of year	16,980	0	0	0	0
Unobligated balance, expired	6	0	0	0	0
Budget Authority	727,250	757,000	780,241	654,777	(125,464)
Financing:					
Transfers from other accounts (-)	(2,750) [1/]	(3,000) [1/]	0	(2,750) [1/]	(2,750)
Transfer to other accounts (+)	0	0	0	0	0
Appropriation	724,500	754,000	780,241	652,027	(128,214)

[1/] Transfers of $1,250K from EAC and $1,500K from DOJ in FY 2019, transfers of $1,500K from EAC and $1,500K from DOJ in FY 2020, and planned transfers of $1,250K from EAC and $1,500K from DOJ in FY 2021.

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
Transfer to Departmental Management Salary and Expenses	…	…	($998)
Other Changes:			
FY 2020 pay increase and related costs	…	…	11,876
FY 2021 pay increase and related costs	…	…	2,874
Change in compensable days	…	…	(1,455)
Annualization of positions financed in FY 2020	0	6	0
Awards	…	…	2,935
Personnel benefits:			
Civil Service Retirement System (CSRS)	…	…	(213)
Federal Employees' Retirement System (FERS)	…	…	4,359
Thrift Savings Plan (TSP)	…	…	61
Federal Insurance Contribution Act (FICA) - OASDI	…	…	238
Health insurance	…	…	1,080
Employees' Compensation Fund	…	…	2
Travel and transportation of persons:			
Mileage	…	…	0
Per Diem	…	…	74
Rental Payments to GSA	…	…	3
Communications, utilities, and miscellaneous charges:			
Postage	…	…	0
Electricity rate	…	…	75
Natural gas rate	…	…	38
Other services:			
Working Capital Fund (Departmental Management)	…	…	1,016
Commerce Business Systems (CBS)	…	…	294
Commerce Enterprise Services	…	…	(134)
Continuous Diagnostics and Mitigation Charges	…	…	389
NARA storage costs	…	…	(16)
Supplies and materials			
Scientific journal subscriptions	…	…	81
General pricing level adjustment	…	…	3,662
Total, adjustments to base	0	6	26,241

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		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease over 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Strategic and Emerging	Pos./Approp	24	$18,457	36	$21,218	36	$21,596	36	$21,596	0	0
Research Initiative Fund	FTE/Obl.	23	12,445	33	25,357	36	21,596	36	21,596	0	0
National Measurement and	Pos./Approp	1,994	544,561	2,008	568,596	2,008	588,877	1,656	505,831	(352)	($83,046)
Standards Laboratories	FTE/Obl.	1,853	560,373	1,933	577,537	1,936	588,877	1,578	507,081	(358)	(81,796)
User Facilities	Pos./Approp	193	53,017	193	52,371	193	54,229	178	49,229	(15)	(5,000)
	FTE/Obl.	180	53,729	186	52,426	186	54,229	171	49,229	(15)	(5,000)
Postdoctoral Research	Pos./Approp	109	12,096	109	13,582	109	14,676	109	14,676	0	0
Associateship Program	FTE/Obl.	101	14,299	105	14,186	105	14,676	105	14,676	0	0
Total	Pos./Approp	2,320	628,131	2,346	655,767	2,346	679,378	1,979	591,332	(367)	(88,046)
	FTE/Obl.	2,157	640,846	2,257	669,506	2,263	679,378	1,890	592,582	(373)	(86,796)

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 to enable 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 impact 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, turned five years old. The framework was developed with a focus on industries vital to national

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

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. The first update to the Framework, Version 1.1, was released last year and has been downloaded over 267,000 times; overall, the Framework has been downloaded over half a million times since its release in 2014. Building on the success of the Cybersecurity Framework, NIST held a series of stakeholder events to gather input for the NIST Privacy Framework, released in draft form for public comment September 6, 2019, which is a voluntary tool for organizations to better identify, assess, manage and communicate about privacy risks. In addition, NIST released a report entitled *Considerations for Managing Internet of Things (IoT) Cybersecurity and Privacy Risks*, outlining security concerns for devices connected to the Internet of Things (IoT) and how to mitigate risk. This report was developed after workshop discussions and public comments and acts as a companion guide to the larger Cybersecurity Framework for raising awareness about security considerations before connecting an IoT device to a network. A follow-up report about understanding and mitigating IoT security concerns is currently undergoing a second round of public comments.

- Opioids Epidemic: Researchers at NIST and state forensic laboratories in Maryland and Vermont developed a new screening technique to help protect the people on the front lines, from first responders to evidence examiners, from lethal exposure to synthetic opioids in the battle against opioids. The NIST method can limit the risk of accidental exposure to fentanyl and other highly potent drugs and can detect, and reliably predict whether a package contains fentanyl, even if mixed with other substances. This quick method to identify dangerous substances can help police get faster answers when investigating drug crimes, will help crime labs select the right test panel for analyzing evidence, and is able to detect new designer drugs that aren't detected by standard methods.

- Strengthening Cryptography: In January 2019, NIST announced the candidates for potential quantum-resistant encryption tools. Collected through the Post-Quantum Cryptography Standardization project, these algorithms can help protect sensitive electronic information from quantum computers and will be considered for standardization. The cryptography community is currently providing input and thoroughly testing the candidates to see how they perform on big computers and smartphones, and also on devices with limited processor power such as smart cards. Current cryptographic algorithms rely on the fact that conventional computers have difficulty with factoring large numbers, which can be done quickly by future quantum computers. This necessitates different mathematical tools to protect our information from quantum and conventional attacks. The candidate algorithms are diverse in their approach and need to be developed quickly and responsibly to replace the current cryptography standards, which are more vulnerable to a quantum attack, in preparation for quantum computing.

- Advanced Communications: Described in a February 2019 Institute of Electrical and Electronics Engineers (IEEE) publication, NIST researchers demonstrated that deep learning algorithms, a form of artificial intelligence, are significantly better than the common method used for detecting when offshore radars are operating. This information is critical to enable companies

to employ the commonly termed “3.5 Gigahertz Band” when not needed for its current primary use for offshore radar operations by the U.S. Navy, per Federal Communications Commission (FCC) rules. Long Term Evolution (LTE) equipment vendors and service providers such as AT&T, Google, Nokia, Qualcomm, Sony, and Verizon have been eager to access this band because it will expand product markets and give end users better coverage and higher data rate speeds in a variety of environments where service is traditionally weak. NIST’s deep learning algorithms appreciably outperformed the standard detectors and will continue to be refined for potential use as spectrum sharing standards. Looking to future technologies, NIST held a Machine Learning for Optical Communications Systems workshop in Boulder in August 2019 to discuss the role of AI training datasets and other resources that can accelerate the developments in this area and is developing a white paper to outline a path forward for the community.

- Advanced Bioscience: NIST is developing the building blocks for bioscience by making high quality reference data and standardized materials available to enable confidence in gene sequencing and drug design through collaborative partnerships such as the Genome Editing Consortium, announced in early 2018. The Genome Editing Workshop was held at NIST in May 2019 to explore the measurement and standards needs of members of industry, academia, government, and others interested in using genome editing to develop products such as medical therapies. As a result of workshops held in 2018 and 2019, version 1 of the NIST Genome Editing Consortium Lexicon was released and underwent a comment period in September 2019. This lexicon will develop a unified standard set of terms and definitions that serve the needs and act as a reference for the genome editing community and will allow the field to progress once language commonality is established.

- 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 (QEDC) in partnership with SRI International. A number of companies signed letters of intent to participate in QEDC, from large corporations such as IBM and AT&T to the companies developing the emerging technology applications such as Rigetti and IonQ. The QEDC 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 QEDC workshop in November 2019 to assess community needs and develop a roadmap for cryogenic technologies to accelerate quantum information sciences R&D and commercialization.

- Artificial Intelligence (AI) Standards: In response to Executive Order 13859 (February 2019), NIST released a plan to “ensure that technical standards minimize vulnerability to attacks from malicious actors and reflect Federal priorities for innovation, public trust, and public confidence in systems that use AI technologies and develop international standards to promote and protect these priorities.” The report, entitled *U.S. Leadership in AI: A Plan for Federal Engagement in Developing Technical Standards and Related Tools*, offers Federal guidance for AI standards development and coordination, promotes focused research on the

trustworthiness of AI calls for expansion of public-private partnerships to advance AI, and highlights related tools needed to support AI, such as benchmarks. This plan was developed with extensive public and private sector involvement at a May 2019 NIST workshop. Through an open comment period on the draft plan, it was released in mid-2019. The plan aims to help the U.S. speed the pace of reliable, robust, and trustworthy AI development.

- Quantum-Based Measurements: Working as part of the NIST-on-a-Chip program, scientists at NIST have made significant strides in applying quantum science breakthroughs to advanced metrology and working to transfer these technologies from the lab to the market. The NIST-on-a-Chip program is aimed at creating prototypes for small, inexpensive, low-power and easily manufactured quantum-based sensors, that can ultimately be mass produced and supplied to industry. One example of this work is a new chip-scale atomic clock based on the ticks of tiny rubidium atoms confined in a tiny glass chamber on a chip that is smaller than a coffee bean. Chip-scale optical clocks could eventually replace traditional oscillators in applications like navigation systems and serve as backup clocks on satellites and would be a significant improvement over the current bulky and complex optical clocks currently in use.

- Space Commerce: In September 2019, NIST hosted a Space Commerce Workshop in conjunction with the Department of Commerce (DOC) Boulder Laboratories, the DOC Office of Space Commerce, and the University of Colorado Boulder (CU). The workshop brought together industry, academia, and Federal government organizations to identify key technology and measurements barriers to deploying and safely operating commercial space technology. Participants identified grand challenges for space commerce and civil space traffic management to help inform DOC resource coordination in response to these challenges. Topics covered included data management, models and algorithms for space situational awareness, spectrum for space services, DOC partnerships, and emerging technologies in the field.

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 2021

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 technical opportunities that are likely to significantly affect America's economy in the coming decades. NIST’s ability to

provide a strong and independent technical foundation for these areas may determine the future of U.S. leadership. This budget request maintains our focus on developing capabilities in key emerging technology areas that will address the internet of things, and industries of the future, namely quantum information science, artificial intelligence (AI), advanced communications, advanced manufacturing, and biotechnology.

- *Quantum Information 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 (AI) and Data Science:* 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.
- *Advanced Communications:* NIST's programs in advanced communications will focus and build its capabilities to support the development of measurements and standards to accelerate the deployment of next-generation communication technologies that promise to be faster and more reliable, including fifth-generation wireless networks, spectrum sharing and security.
- *Advanced Manufacturing*: NIST continues to engage in targeted research activities in support of advanced manufacturing, ranging from work on materials design and discovery to the use of collaborative robots and factories, to biomanufacturing and standards for data exchange and processing information that promote the application of smart manufacturing systems, and artificial intelligence-based solutions that will help the U.S. remain a competitive force in advanced manufacturing to ensure our economic and national security.
- *Biotechnology:* 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 continues to play a significant role in support of the U.S. bioeconomy, through building next generation measurement science (biometrology) capabilities and engineering biology laboratories for accelerating responsible biotechnology innovations.
- *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's research supports the development of technical standards that are crucial to drive innovation and applications. Over 400 NIST staff participate in international standards activities as technical experts and in leadership roles. Standards underpin every aspect of our daily lives, from enabling communication technologies such as Bluetooth and WiFi to ensuring the safety of devices such as pacemakers and step ladders. They promote confidence in the performance of products and enable international trade. The standards leadership and expertise provided by NIST is an essential element of a broader U.S. effort to lead in the emerging technologies that will define the 21st century economy.

Explanation and Justification

Line Item		2019 Actual		2020 Enacted		2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Laboratory Programs	Pos./BA	2,320	$628,131	2,346	$655,767	2,346	$679,378
	FTE/Obl	2,157	640,846	2,257	669,506	2,263	679,378

Laboratory Programs (FY 2021 Request by Program Area shown below. Total Funding: $679.4 million and 2,346 Positions)

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

Exploratory Measurement Science ($74.1 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) a National Research Council (NRC) Postdoctoral Associate was an integral part of a team that created the world's first network of optical atomic clocks using both fiber optic and free space connections, a major advance toward creating international timekeeping based on optical clocks with 100-fold greater accuracy and stability than current microwave clock standards; (2) uniting NIST expertise in wireless communications, manufacturing, and AI, a team of NIST researchers is creating the first repeatable, over-the-air testbed for dynamic wireless systems in an industrial environment. Using an innovative array of quantum probes, the team is developing methods to enable U.S. industry to train and verify their wireless Industrial Internet of Things technologies and networks.

Advanced Manufacturing and Material Measurements ($119.8 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" by enabling the development of a strong U.S. manufacturing base that is essential to our economic and national security.

Fundamental Measurement, Quantum Science, and Measurement Dissemination ($191.5 million) –

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. In FY 2021, NIST is investing $40.3 million on the portfolio of foundational quantum research impacting quantum computing, communications, and cryptography. This research combined with NIST's expertise in advanced materials, nanofabrication, and microelectronics, our network of joint institutes (JILA, and JQI) and the newly created Quantum Economic Development Consortium make NIST a true hub of quantum innovation. In FY 2021, NIST will focus a portion of its quantum research portfolio on the grand challenge of quantum networking. A key challenge in the long-term evolution of quantum technologies, as the full economic and security benefit of quantum will be dependent upon the ability to securely and efficiently transmit quantum information between multiple quantum devices and sensors.

Advanced Communications, Networks, and Scientific Data Systems ($68.0 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, a term used to describe future wireless networks that will be faster and more reliable. These technologies will be necessary for self-driving cars, internet of things (IoT) applications, drones, and future AI systems. NIST is committed to solving the measurement and deployment challenges of these fast-moving fields to help the U.S. achieve and maintain global leadership in these areas.

Cybersecurity and Privacy ($78.1 million) – NIST is the Department of Commerce lead agency on Cybersecurity issues. NIST's Cybersecurity and Privacy activities strengthen the security of our digital world through a portfolio bridging foundational and applied cybersecurity research, and through the development of publicly available standards and technical guidance. NIST's sustained outreach supports the effective application of standards and best practices enabling the adoption of practical cybersecurity and privacy. 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 ($34.9 million) – NIST is paving the way for a vibrant U.S. biotechnology market by developing measurements that enable the reproducibility of biomedical research results to ensure the efficacy and safety of treatments and ultimately increase confidence in clinical decisions. 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. New and improved measurement capabilities provide the basis for industries to harness this information for future medical technologies.

Physical Infrastructure and Resilience ($58.9 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 safer for both residents and first responders. In collaboration with policy makers, building officials, and planning groups, NIST produces guides to help communities integrate resilience into their economic development, zoning, mitigation, and other local planning activities that impact buildings, public utilities, and infrastructure systems.

NIST User Facilities ($54.1 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 advances the measurement science underlying wireless technologies ranging from the microchips that generate and process signals to the antennas that send and receive them. 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 three primary program areas:
  - Public Safety Communications Research – Conducting research that enables the development of performance-based standards for first responder communications,

- Spectrum Sharing and Optimization – Facilitating and coordinating spectrum sharing and related engineering capabilities while creating a trusted capability for spectrum sharing evaluations, and
- Next Generation (5G) Wireless – Advancing measurement science for next generation wireless systems including characterizing millimeter wave (mmWave) radio channels and performance assessment.

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 support areas of national importance, such as:

- Disaster Resilience – 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
- Sustainability and Energy– 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. 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 – Bridging foundational and applied cybersecurity research and development and cybersecurity operations through the development of standards and technical guidance
- Health Information Technology – Improving quality and reducing costs of healthcare by advancing performance standards and testing tools that enable a robust IT infrastructure
- 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, structural steels, complex fluids, and more
- Energy – Characterizing the performance of fossil, renewable, and next-gen alternative fuels
- Health Care – Enhancing technology realization in clinical diagnostics, tissue engineering, and more efficient manufacture of biologic drugs
- Infrastructure – Assessing aging physical infrastructure and determining drinking water quality
- Manufacturing – Accelerating development of lightweight alloys for fuel-efficient automobiles, materials for advanced electronics, and chemical manufacturing, and
- Safety, Security and Forensics – Ensuring confidence in gunshot and explosive residue detection, the performance of body armor materials, and DNA-based human identity testing.

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 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 *n*Soft Consortium 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. PML develops measurement methods and fundamental science for length, force and shock, time, electricity, gas flow, and radiation that underpin the international system of weights and measures upon which science and the global economy rely. This measurement expertise also helps America address key technical challenges in:
  - Manufacturing – Helping industry improve efficiency by providing measurement solutions, researching new embedded standards, laser welding diagnostics, computer memory technology
  - Energy – Enabling effective transition to solid state lighting and initiating research to support advanced electric grid, hydrogen fuel cell and rechargeable battery technologies
  - 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/pml

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGES FOR 2021
(Dollar amounts in thousands)

		2021 Base		2021 Estimate		Increase/Decrease from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Laboratory Programs	Pos/BA	2,331	$655,458	1,940	$539,997	(391)	($115,461)
	FTE/Obl.	2,252	655,458	1,861	541,247	(391)	(114,211)

Laboratory Programs Reduction (-$115,461, -391 FTE/-391 Positions) – To meet the topline funding levels proposed in the FY 2021 President's Budget request and support the Administration's stated priorities for Industries of the Future (IoTF) in quantum information science, artificial intelligence, advanced communications, advanced manufacturing, and biotechnology -- NIST reevaluated the reductions previously proposed by the Administration to ensure that NIST could continue to provide the broadest portfolio of measurement science standards possible, while preserving and increasing efforts relevant to quantum science, artificial intelligence, and microelectronics. To accomplish this NIST will have to make substantial reductions to its current R&D and program portfolio that impact work in advanced materials, physical infrastructure and resilience, and areas across NIST. The funding for the NIST laboratory programs will be reduced by $115.5 million and this reduction proposes the elimination of 391 employees. Of those employees, over 350 come from NIST's scientific workforce, a roughly 15 percent reduction of NIST's technical workforce. The request for laboratory programs is approximately a 15 percent reduction from currently enacted levels. The proposed reductions affect the following mission functions and programmatic areas summarized below:

Advanced Manufacturing and Material Measurements (-$37.5 million, -178 Positions) – To support the priorities outlined in the President's FY 2021 request NIST will reduce its total spending focused on advanced manufacturing and material measurements from $119.8 million to $82.3 million, a 31.3 percent reduction. NIST will continue to support research and metrology activities in support of advanced manufacturing that further the development of advanced robotics and automation, next-generation quantum systems and microelectronics. In addition, NIST will prioritize the application and development of measurements and standards that promote the application of artificial intelligence-based solutions to challenges in materials science and advanced manufacturing. NIST will terminate a significant portion of its materials research portfolio focused on structural materials challenges that includes work on materials integrity and reliability testing (e.g., for bridges and pipelines),

body armor testing, trace materials detection (including work supporting detection of explosives and synthetic opioids). NIST will also stop work on materials issues relevant to energy and environmental applications -- such as the development of thermoelectric materials, and a grants program for the recycling and reuse of plastics. NIST will no longer be able to support the dissemination of multiple standard reference materials and standard reference data set in support of materials development and testing (including the Charpy impact standard and the thermophysical properties program). NIST will also cease operation of its beam-lines at the Brookhaven National Laboratory ending a decades-long partnership and investment in leading-edge materials characterization instruments.

Fundamental Measurement, Quantum Science, and Measurement Dissemination (-$17.8 million, -73 Positions) – The FY 2021 request will reduce NIST's spending in areas of core metrology and measurement dissemination from $191.5 million to $173.7 million, a 9.3% reduction. To prioritize work focused on advancing quantum science (including efforts focused on quantum networking) and transforming how NIST disseminates measurements through the NIST-on-A-Chip program, NIST will discontinue several measurement service and dissemination activities that are currently provided to our stakeholders in industry, government and academia. Where possible NIST has looked to discontinue services where there are similar services available from other countries or providers. However, even with other providers available the level of uncertainty in measurement comparability across the world will increase. NIST will stop or reduce measurements and calibrations including: radio frequency calibration services that support customers in communications and defense; UV calibrations that support customers from semiconductor tool manufacturers to the aerospace industry; production and dissemination of the atomic spectral database; gas and fluid metrology supporting customers in energy extraction and transportation; and a reduction in the provision of certain time and frequency related services. NIST would also stop several activities focused on the development of nanoscale imaging and fabrication tools where the applications are not focused on advanced electronics or materials manufacturing applications. NIST will also be unable to maintain its current presence and contributions in the area of international legal metrology.

Advanced Communications, Networks, and Scientific Data Systems (-$35.8 million, -83 Positions) – The FY 2021 request will reduce NIST spending in advanced communications, networks, and scientific data systems from $68 million to $32.2 million, a 52 percent reduction. NIST is working to focus and build its capabilities to support the development of measurements and standards to further the development and deployment of artificial intelligence-based technologies and services – a main focus being the development of the measurement infrastructure to define the concept of trustworthy AI. NIST will also be prioritizing efforts to address critical challenges around 5G communications and advanced communications, spectrum sharing, and security. NIST will have to eliminate programs addressing a number of IT and data challenges. These include the following measurements and standards work: internet infrastructure protection, cloud computing, medical record interoperability, voting technologies, data visualization, and efforts related to smart grid interoperability.

Health and Biological Systems Measurements (-$3 million, -0 Positions) – The FY 2021 budget request will reduce NIST's spending on health and biological science measurements not related to biomanufacturing from $34.9 million to a proposed level of $31.9 million, an 8.6 percent reduction. NIST is focusing its efforts in the biosciences to build the measurement science capabilities necessary to support progress in engineering biology and providing the measurement assurance for advanced imaging, gene editing, and other new platform technologies. To reduce overall operational costs, NIST will consolidate its research efforts at its campus in Gaithersburg, MD and end its support for the Joint Institute for Metrology in Biology (JIMB) which is a partnership with the Stanford Linear Accelerator Center (SLAC) and Stanford University to develop advanced measurements capabilities for the growing synthetic biology industry.

Physical Infrastructure and Resilience (-$16.4 million, -42 Positions) – The FY 2021 request will reduce efforts supporting physical infrastructure and resilience from $58.9 million to $42.5 million, a 28 percent reduction. NIST will continue to develop high-priority measurement methods and disseminate reference materials and data that support innovation in performance and resilience of the built environment, including work in fire research. However, NIST will eliminate work on developing and deploying advances in science and technology to markedly improve building energy efficiency and occupant safety in the U.S. This includes elimination of work at the Net-Zero energy, high-performance building facility, as well as embedded intelligence in building control and operation. NIST will also eliminate funding for the Disaster Resilience Research Grants Program and the Fire Research Grants Program.

NIST User Facilities (-$5 million, -15 Positions) – The FY 2021 request will reduce the funding available to support NIST's user facility efforts from $54.1 million to $49.1 million a 9.2 percent reduction. NIST's user facilities, the NIST Center for Neutron Research (NCNR) and the Center for Nanoscale Science and Technology's nanofabrication facility annually provide over 3,000 scientists from academia and industry unique world-class capabilities that help move the state-of-the-art forward in advanced materials, quantum science, energy, medicine, and other critical technology areas. To meet the funding levels outlined in the President's FY 2021 budget request, NIST will make operational adjustments and reduce user services at the NCNR. These include ceasing operation of two neutron scattering instruments, the withdrawal of three instruments from the user program, a stoppage of planning for a replacement reactor, and reduction in funding for reactor maintenance. These closures will result in the loss of 200 research participants annually, a significant reduction in scientific productivity, and a potential increase in unscheduled reactor shutdowns which cost on average of a $140,000 a day.

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: Laboratory Programs Reduction

Full-time permanent

Title		Grade	Number	Annual Salary	Total Salaries
Scientist/Engineer		ZP V	(67)	$142,701	($9,560,967)
Scientist/Engineer		ZP IV	(134)	121,316	(16,256,344)
Scientist/Engineer		ZP III	(30)	86,335	(2,590,050)
Scientist/Engineer		ZP II	(8)	59,534	(476,272)
Management and Program Analyst		ZA IV	(25)	121,316	(3,032,900)
Management and Program Analyst		ZA III	(58)	86,335	(5,007,430)
Management and Program Analyst		ZA II	(4)	65,561	(262,244)
Engineering Technician		ZT V	(2)	102,663	(205,326)
Engineering Technician		ZT IV	(10)	86,335	(863,350)
Engineering Technician		ZT III	(15)	65,561	(983,415)
Administrative Support		ZS V	(2)	65,561	(131,122)
Administrative Support		ZS IV	(3)	53,901	(161,703)
Administrative Support		ZS III	(30)	43,798	(1,313,940)
Administrative Support		ZS II	(3)	35,119	(105,357)
Total			(391)		(40,950,420)
Less lapse	0.00%		(0)		(0)
Total full-time permanent (Positions)			(391)		(40,950,420)
2021 pay Adjustment (1.0%)					(0)
					(40,950,420)

Personnel Data Summary	
Full-time Equivalent Employment (FTE)	
Full-time permanent	(391)
Total FTE	(391)
Authorized Positions	
Full-time permanent	(391)
Total Positions	(391)

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: Laboratory Programs Reduction

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11.1	Full-time permanent compensation	$243,492	$252,161	$260,160	$219,210	($40,950)
11.3	Other than full-time permanent	20,608	21,249	21,920	21,920	0
11.5	Other personnel compensation	6,554	6,526	9,432	9,432	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	270,654	279,936	291,512	250,562	(40,950)
12.1	Civilian personnel benefits	84,449	94,936	103,566	91,200	(12,366)
13	Benefits for former personnel	67	67	67	67	0
21	Travel and transportation of persons	9,661	11,152	11,226	10,042	(1,184)
22	Transportation of things	679	777	796	691	(105)
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	118	118	110	110	0
23.2	Rental payments to others	1,972	2,009	2,049	2,049	0
23.3	Communications, utilities, and misc. charges	14,864	17,858	17,999	13,115	(4,884)
24	Printing and reproduction	461	558	570	59	(511)
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	1,459	1,663	1,708	1,618	(90)
25.2	Other services from non-Federal sources	25,680	15,810	11,303	4,853	(6,450)
25.3	Other goods and services from Federal sources	34,358	37,001	37,834	33,584	(4,250)
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	39,878	42,201	43,085	25,285	(17,800)
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	22,034	22,093	22,540	22,335	(205)
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	21,154	21,027	21,464	17,869	(3,595)
31	Equipment	34,111	34,127	30,829	26,158	(4,671)
32	Lands and structures	18	18	18	18	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	63,285	64,235	58,782	40,382	(18,400)
42	Insurance claims and indemnities	2	0	0	0	0
43	Interest and dividends	22	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	624,926	645,586	655,458	539,997	(115,461)

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGES FOR 2021
(Dollar amounts in thousands)

		2021 Base		2021 Estimate		Increase from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Laboratory Programs -	Pos/BA	15	$23,920	39	$51,335	24	$27,415
Industries of the Future	FTE/Obl.	11	23,920	29	51,335	18	27,415

Measurement Tools and Testbeds to Power the Industries of the Future (IoTF) (+$27,415, +18 FTE/+24 Positions) – NIST requests $27.4 million to create measurement tools and testbeds to support deploying, at scale, the technologies that will power the Industries of the Future and define the economy of the 21st century and beyond.

Artificial Intelligence ($25 million): The focal point of these investments ($25 million) is accelerating the development and adoption of Artificial Intelligence (AI) technologies to ensure they are interoperable, secure, and reliable. The requested funds will enable NIST to work toward the deeper, consistent, and long-term engagement of the Federal government outlined in the NIST report *U.S. Leadership in AI: A Plan for Federal Engagement in Developing Technical Standards and Related Tools*, issued in response to Executive Order 13859. As the AI Standards Coordinator of the National Science and Technology Council Machine Learning/Artificial Intelligence Subcommittee, NIST will work with the interagency to gather and share AI standards-related needs, strategies, roadmaps, and other important components to support trustworthy AI in government operations. Based on this information, NIST will conduct research, participate in standards development, and work with partners. NIST will support robust stakeholder engagement with academia, industry, and government through roundtables and other workshops to refine trustworthy AI research challenges and address these needs through committed partnerships with leading research institutions, funded through cooperative agreements. NIST requests funds for the development of the standards-related tools outlined in the *U.S. Leadership in AI* report, including datasets and use cases to supercharge efforts for new AI systems across a range of application areas, from advanced materials discovery to manufacturing robotics and wireless spectrum management. Increasingly, AI and IoTF systems are pushing the limits for information processing and computational power. Working with other Federal agencies, NIST will identify key measurement needs for AI hardware, such as neuromorphic computing architectures, and begin a research program to address these needs. NIST will build out testbeds for demonstration of AI and wireless communications in automated factories and other real-world environments to stress-test technological feasibility, interoperability, and product and systems integration to create a level playing ground in which the U.S. can compete more fairly.

5G ($1.4 million): The IoTF request also invests $1.4 million for standards development efforts for 5G to ensure that the U.S. maintains global leadership with regards to advanced communications standards. The Administration has unequivocally and unambiguously noted its intent to ensure American leadership in the next generation of advanced communication technologies, calling for a National Spectrum Strategy that will help ensure American leadership in terrestrial wireless and satellite technologies for 5G and beyond. The requested funds will ensure a prominent role of U.S. government in the development of standards that will underpin the success and wide deployment of 5G technologies.

Position, Navigation and Timing ($1 million): The IoTF request includes $1 million to accelerate efforts to develop profiles for Position, Navigation and Timing (PNT) in accordance with the Administration's efforts to support Strengthening National Resilience through Responsible Use of Positioning, Navigation, and Timing Services. Leveraging the NIST Cybersecurity Framework NIST will work with the public and private sectors to develop PNT profiles that are intended to further the public and private sectors' ability to identify systems, assets, and networks dependent on PNT services; and to manage the associated risks to these systems.

Performance measure: Robust and well-characterized AI datasets available for training and evaluation of AI systems in application areas including advanced materials, manufacturing robotics, IoTF, and wireless spectrum management.

	2021	2022	2023	2024	2025
With Increase	3	6	8	16	24
Without Increase	1	2	3	3	4

Department of Commerce
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: Measurement Tools and Testbeds to Power the Industries of the Future

Full-time permanent

Title	Grade	Number	Annual Salary	Total Salaries
Data Analyst	ZP V	1	$142,701	$142,701
Data Engineer	ZP V	1	142,701	142,701
Data Engineer	ZP IV	2	121,316	242,632
Administrator	ZA IV	1	121,316	121,316
Cybersecurity Specialist	ZP IV	1	121,316	121,316
Electrical Engineer	ZP IV	1	121,316	121,316
Materials Scientist	ZP IV	1	121,316	121,316
Physical Scientist	ZP IV	1	121,316	121,316
Roboticist	ZP IV	1	121,316	121,316
Statistician	ZP IV	1	121,316	121,316
Computer Scientist	ZP III	3	86,335	259,005
Data Engineer	ZP III	2	86,335	172,670
Electrical Engineer	ZP III	1	86,335	86,335
Mechanical Engineer	ZP III	1	86,335	86,335
Physical Scientist	ZP III	2	86,335	172,670
Testbed Technician	ZT III	1	65,561	65,561

Exhibit 14

Title		Grade	Number	Annual Salary	Total Salaries
Administrator Support		ZS IV	1	$53,901	$53,901
Administrative/ Technical Support		ZA II	2	65,561	131,122
Total			24		2,404,845
Less lapse	25.00%		(6)		(601,211)
Total full-time permanent (FTE)			18		1,803,634
2021 pay Adjustment (1.0%)					18,036
					1,821,670

Personnel Data Summary

Full-time Equivalent Employment (FTE)	
Full-time permanent	18
Total FTE	18
Authorized Positions	
Full-time permanent	24
Total Positions	24

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: Measurement Tools and Testbeds to Power the Industries of the Future

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11.1	Full-time permanent compensation	$207	$1,155	$1,155	$2,977	$1,822
11.3	Other than full-time permanent	0	0	0	0	0
11.5	Other personnel compensation	0	0	0	0	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	207	1,155	1,155	$2,977	1,822
12.1	Civilian personnel benefits	62	341	341	886	545
21	Travel and transportation of persons	74	89	89	321	232
22	Transportation of things	30	37	37	115	78
23.3	Communications, utilities, and misc. charges	1,841	2,734	2,734	5,593	2,859
24	Printing and reproduction	32	44	44	555	511
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	5	5	5	5	0
25.2	Other services from non-Federal sources	2,858	4,816	4,816	11,003	6,187
25.3	Other goods and services from Federal sources	249	458	458	2,231	1,773
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	1,200	1,700	1,700	2,700	1,000
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	70	104	104	306	202
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	380	470	470	3,240	2,770
31	Equipment	3,912	4,967	4,967	9,403	4,436
32	Lands and structures	0	0	0	0	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	5,000	7,000	7,000	12,000	5,000
44	Refunds	0	0	0	0	0
99.9	Total obligations	15,920	23,920	23,920	51,335	27,415

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		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease over 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Corporate Services	Pos./Approp	29	$17,300	29	$17,311	29	$17,762	23	$11,960	(6)	($5,802)
	FTE/Obl.	27	17,322	28	17,315	28	17,762	22	11,960	(6)	(5,802)
Total	Pos./Approp	29	17,300	29	17,311	29	17,762	23	11,960	(6)	(5,802)
	FTE/Obl.	27	17,322	28	17,315	28	17,762	22	11,960	(6)	(5,802)

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 Department of Commerce (DOC), Office of Management and Budget, Government Accountability Office, Department of Treasury, and Congress.

Statement of Operating Objectives

In FY 2021, 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;
- Refresh IT infrastructure equipment nearing end-of-life with modern, higher-capacity equipment;

- Transition NIST internet connections to NOAA N-Wave and expand throughput; 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		2019 Actual		2020 Enacted		2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Corporate Services	Pos./BA	29	$17,300	29	$17,311	29	$17,762
	FTE/Obl	27	17,322	28	17,315	28	17,762

Corporate Services (Total Funding: $17.8 million and 29 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-supporting American corporate leadership requires;
- Ensuring network equipment is maintained and reliable to ensure network availability and support 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 major consolidation and modernization initiatives of multiple business systems, functions, and processes. DOC envisions common, Department-wide, user-friendly, and flexible systems to support the management of financial, procurement, travel, grants, property, and other administrative functions. NIST's business systems are an integral part of DOC's vision for consolidation and modernization. As DOC moves into the procurement phase for a new financial system, NIST has representatives on the technical evaluation team and the advisory committee. NIST supports DOC's effort to pursue a modernized Grants Management solution and continues to provide input to DOC/Office of the Chief Information Officer's Grants Enterprise Management System effort.

The base funding requested of $17.8 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 ($3.1 million)
- Fundamental Measurement, Quantum Science, and Measurement Dissemination ($5.8 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 ($1.3 million)

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGES FOR 2021
(Dollar amounts in thousands)

		2021 Base		2021 Estimate		Increase/Decrease from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Corporate Services	Pos/BA	29	$17,762	23	$11,960	(6)	($5,802)
	FTE/Obl.	28	17,762	22	11,960	(6)	(5,802)

Corporate Services Programmatic Decrease (-$5,802, -6 FTE/-6 Positions) – Consistent with NIST's priority to focus resources on the laboratory programs, NIST is proposing reductions to the Corporate Services sub program line by approximately 32 percent, a reduction of $5.8 million dollars. NIST relies on centralized Information Technology (IT) support to provide secure, centrally managed IT infrastructure resources which leads to improved measurement methods, standards advance, reference data, and research results benefiting numerous sectors of the U.S. economy.

In support of this mission, NIST maintains a Network Roadmap which is a phased, prioritized approach for upgrading the network and maintaining performance consistent with its mission requirements. NIST will reduce its plans to purchase contractual support to install only the most critically needed IT infrastructure improvements to upgrade its network capacity to enable large-scale data transfers.

To preserve its support to the core programs in our laboratories, NIST will also reduce staff and funding levels of contractual services that support NIST's business systems which are an integral part of DOC's vision for consolidation and modernization of its business systems.

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: Corporate Services
Program Change: Corporate Services Reduction

Full-time permanent

Title		Grade	Number	Annual Salary	Total Salaries
Information Technology Specialist		ZA V	(1)	$142,701	($142,701)
Information Technology Specialist		ZA IV	(3)	121,316	(363,948)
Management and Program Analyst		ZA IV	(1)	121,316	(121,316)
Management and Program Analyst		ZA III	(1)	86,335	(86,335)
Total			(6)		(714,300)
Less lapse	0.00%		(0)		(0)
Total full-time permanent (Positions)			(6)		(714,300)
2021 pay Adjustment (1.0%)					(0)
					(714,300)

Personnel Data Summary

Full-time Equivalent Employment (FTE)	
Full-time permanent	(6)
Total FTE	(6)
Authorized Positions	
Full-time permanent	(6)
Total Positions	(6)

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: Corporate Services
Program Change: Corporate Services Reduction

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11.1	Full-time permanent compensation	$3,588	$3,699	$3,840	$3,126	($714)
11.3	Other than full-time permanent	306	316	328	328	0
11.5	Other personnel compensation	98	101	105	105	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	3,992	4,116	4,273	3,559	(714)
12.1	Civilian personnel benefits	1,247	1,286	1,335	1,120	(215)
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	64	64	64	36	(28)
22	Transportation of things	52	52	52	51	(1)
23	Rent, communications, and utilities	0	0	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 misc. charges	445	445	454	157	(297)
24	Printing and reproduction	37	37	38	36	(2)
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	6,768	6,598	6,731	3,786	(2,945)
25.3	Other goods and services from Federal sources	0	0	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	0	0	0	0	0
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	418	418	427	367	(60)
31	Equipment	4,299	4,299	4,388	2,848	(1,540)
32	Lands 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	17,322	17,315	17,762	11,960	(5,802)

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		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease over 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Standards Coordination and Special Programs	Pos./Approp	208	$79,069	211	$80,922	211	$83,101	186	$48,735	(25)	($34,366)
	FTE/Obl.	193	88,671	201	87,159	201	83,101	176	50,235	(25)	(32,866)
Total	Pos./Approp	208	79,069	211	80,922	211	83,101	186	48,735	(25)	(34,366)
	FTE/Obl.	193	88,671	201	87,159	201	83,101	176	50,235	(25)	(32,866)

* Includes Baldridge Performance Excellence Program (BPEP) funded at $2.2 million.

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: 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) manages 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 main areas of research coordinated by SPO are highlighted below.

   - Forensic Sciences: The SPO manages research across the NIST laboratories helping strengthen the scientific rigor of forensic techniques that include the following areas: firearms and tool mark analysis, pattern and impression analysis including latent friction ridge analysis, footprint, tread and tire analysis, trace evidence including paint and coatings, fiber, hair, glass, metals and plastics analysis, geological evidence analysis, questioned document analysis, crime scene analysis, fire scene and fire debris analysis, explosives analysis, controlled substance and toxicology analysis, computer forensics, multi-media, digital and image analysis, voice spectral analysis, serology and DNA analysis, and medicolegal and death investigation.

   - Greenhouse Gas Measurements and Climate Research Program: The SPO continues to coordinate research in various NIST labs focused on providing the measurement science basis for accurate and comparable quantitative measurements of

greenhouse gas emissions. This work can enable the development of international measurement standards to ensure the accuracy of global assessments of greenhouse gas emissions. At the FY 2021 request levels, the management of this research will be absorbed by the responsible NIST laboratories.

- National Security Standards Program: The SPO coordinates efforts with external agency partners to develop technical standards and conformity assessment activities, related to national security. The focus is on measurement science and standards for Chemical/Biological/Radiological/Nuclear/Explosive detection, personal protective equipment, and physical infrastructure resilience and security.

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, 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 operates 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.; provides 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; and designs and implements procedures for accrediting laboratories for their capability to provide calibrations traceable to national standards.

In addition to the work of the SPO and the SCO, this budget activity and subactivity also houses the funding for the NIST Centers of Excellence Program. The NIST Center of Excellence Program supports collaborations between NIST and leading research institutes in emerging technology areas to expand NIST's impact and mission delivery through strategic partnerships with the country's foremost experts in critical technology areas.

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.

- The Center for Risk-based Community Resilience, a NIST-funded Center of Excellence, released the first version of IN-CORE (Interdependent Networked Community Resilience Modeling Environment) on Friday, December 20, 2019. IN-CORE is being developed to enable simulation of community-scale impacts of hazard events and computing resilience measures at the community level. The first version provides example notebooks for the Joplin, Missouri tornado and Seaside, Oregon earthquake-tsunami hazard events. IN-CORE and supporting information can be accessed at http://resilience.colostate.edu/in_core.shtml.
- The Center for Hierarchical Materials Design (CHIMaD), a NIST-funded Center of Excellence involving Northwestern University, University of Chicago, and Argonne National Labs, created the Materials Data Facility (MDF). MDF recently partnered with the Department of Energy to create the "Data and Learning Hub for Science" referred to as DLHub. DLHub leverages the existing CHiMaD tools with new capabilities to collect, publish and categorize Artificial Intelligence/Machine Learning models, allow others to use those models, search among those models, and overall increase the reproducibility of machine learning applications to materials R&D (and beyond to the entire portfolio of scientific research). Example applications of these efforts in x-ray science, batteries, and microscopy have been demonstrated.
- The Center for Statistics and Applications in Forensic Evidence (CSAFE), a NIST-funded Center of Excellence, launched a Data Portal providing public access to databases from four forensic disciplines. CSAFE's team of approximately 80 researchers has published databases with almost 1 million steganography images; 8,211 shoe outsole images; 2,430 handwriting samples; and 61 bloodstain pattern images. In addition, CSAFE researchers collected and uploaded more than 300 3D bullet scans to the NIST Ballistics Toolmark Research Database. Currently, few forensic databases are publicly available. The open access databases funded and constructed by CSAFE enable NIST, the forensic science community, and academic researchers to evaluate existing forensic science practices and develop new statistical techniques for pattern and digital evidence.

- SCO issued NIST Special Publication 2000-02 “Conformity Assessment Considerations for Federal Agencies” and provided expertise to Federal agencies in this area. Conformity assessment programs are designed to ensure compliance with technical and safety requirements; they provide confidence that requirements in legislation, regulation, policy, and procurement are being met. In 2019 NIST provided expertise to the U.S. Trade Representative to inform discussions with trading partners such as the European Union to identify opportunities to cooperate and reduce potentially duplicative conformance requirements that can increase the cost of U.S. exports and delay their entry into foreign markets.
- NIST’s National Voluntary Laboratory Accreditation Program (NVLAP) developed a transition plan to ensure all NVLAP-accredited laboratories will meet the requirements of ISO/IEC 17025:2017, an update to the standard that is used to accredit testing and calibration laboratories. NVLAP experts led the committee that revised this standard and are assisting laboratories to implement various aspects of the new standard. The plan is designed to ensure that all laboratories will be able to maintain their accreditation based on the new standard by November 30, 2020.

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 – NIST will complete the transition of the management of the remaining funds that support internal R&D in forensics, greenhouse gas measurements, and national security standards activities into the relevant NIST Laboratories organizations, and this transition will be reflected in future budget submissions. In forensic science, NIST will continue to conduct the research necessary to support the development of science-based standards, measurement methods, tests and validation studies to underpin reliable, accurate, interoperable and validated forensic analysis. NIST researchers work both on technologies for forensic analysis and the mathematical and statistical tools that help quantify confidence in the results of a forensics test. To disseminate this work into the forensic community, NIST develops measurement protocols, calibration systems, reference and materials and data, and works with standards-developing organizations to formalize many of these as consensus standards.

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 step up its work in this area.

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. 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 (BPEP) - 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 $2.2 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		2019 Actual		2020 Enacted		2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Standards Coordination and Special Programs	Pos./BA	208	$79,069	211	$80,922	211	$83,101
	FTE/Obl	193	$88,671	201	$87,159	201	$83,101

Standards Coordination and Special Programs (Total Funding: $83.1 million and 211 Positions)

NIST's mission is an 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 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 $83.1 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 ($58.4 million)*
- *Exploratory Measurement Science ($2.2 million)*
- *Advanced Manufacturing and Material Measurements ($13.1 million)*
- *Physical Infrastructure and Resilience ($5.1 million)*
- *Health and Biological Systems Measurements ($2.1 million)*

Additionally, this Activity/Subactivity funds the Baldrige Performance Excellence Program at $2.2 million.

Department of Commerce
National Institute of Standards and Technology
Scientific and Technical Research and Services
PROGRAM CHANGES FOR 2021
(Dollar amounts in thousands)

		2021 Base		2021 Estimate		Decrease from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Standards Coordination and Special Programs	Pos/BA	211	$83,101	186	$48,735	(25)	($34,366)
	FTE/Obl.	201	83,101	176	50,235	(25)	(32,866)

Standards Coordination and Special Programs Reduction (-$34,366, -25 FTE/-25 Positions) – Consistent with NIST's priority to focus resources on the laboratory programs, NIST is proposing reductions to the Standards Coordination and Special Programs sub-program line by 42 percent, a reduction of $34.4 million dollars. The Standards Coordination and Special Programs sub-program line houses two cross-NIST activities managed by the Associate Director for Laboratory Programs: crosscutting R&D programs, and documentary standards coordination and policy development. The proposed reductions will largely eliminate external R&D partnerships that expand and broaden the impact of the NIST Laboratory R&D programs. They will also eliminate crosscutting R&D program management functions of the Special Programs Office, leaving the individual NIST laboratories responsible for remaining intramural work to take on those responsibilities. Specific details of the reductions are outlined in detail below.

Office of Special Programs (-$14.9 million, -25 Positions) – The Office of Special Programs manages selected cross NIST programs, and certain extramural focused activities. In order to ensure that NIST has the necessary resources to support the research priorities identified in the President's Budget request and ensure that NIST has sufficient resources to support its core metrology research and services, NIST will terminate all extramural grant programs supported by the office -- and eliminate the cross-NIST program management functions of the office. The management of the remaining funds supporting internal R&D activities in the NIST laboratories will be taken over by the responsible lab organization.

The major activities within the Office of Special Programs that will be eliminated include: (1) NIST will eliminate research grants to external partners, including the funds supporting the Urban Dome program that supports test-beds in urban environments to advance the development of technologies for the direct measurement of greenhouse gas emissions at the scale of an urban region or city. These reductions will terminate support for three urban test beds: the Indianapolis Flux Experiment, or INFLUX, the Los Angeles Megacity Carbon Project, and the Northeast Corridor Project which stretches from Washington, D.C. to Boston, Massachusetts; (2) NIST will no longer support a centrally managed forensic science research program, rather NIST measurement science research supported by the current program will continue but will be managed by the specific NIST laboratory responsible for carrying out the work; and (3) NIST will also reduce support for the operation of the Organization of

Scientific Area Committees (OSAC) program that was established to facilitate the development and promulgation of consensus-based forensic science standards and guidelines that are fit-for-purpose and based on sound scientific principles, promote their use by accreditation and certification bodies, and establish and maintain working relationships with similar organizations.

Standards Coordination Office (-$4.5 million, -0 Positions) – The Standards Coordination Office provides standards policy coordination across the U.S. government, standards conformity assessment activities, and resources and tools that help U.S. stakeholders navigate the complex international standards landscape. The FY 2021 budget would reduce the funding of the Standards Coordination Office by $4.5 million. These reductions will eliminate grants and contracts for standards education and training related activities targeted at integrating standards content into undergraduate and graduate curricula in science, engineering, business, public policy, and law. In addition, NIST would reduce by $3.5 million the Lab 2 Market (L2M) Initiative, a program intended to enhance technology transfer across the Federal government. The reduction in L2M funding will specifically eliminate support provided to other Federal partners to develop and improve technology transfer tools, processes, and support services.

NIST Center of Excellence Program (-$15.0 million, -0 Positions) – The NIST Center of Excellence Program supports collaborations between NIST and leading research institutes in emerging technology areas to expand NIST's impact and mission delivery through strategic partnerships with the country's foremost experts in critical areas. Currently, NIST supports three Centers of Excellence in Advanced Materials, Community Resilience, and Forensic Science. To meet the requested funding levels for FY 2021 and be able to support the priority investments in the Industries of the Future (quantum science, Artificial Intelligence (AI), and advanced communications, and advanced manufacturing) while maintaining a forward-looking core capability in our intramural measurement science, NIST proposes to eliminate all funding for the Center of Excellence Program.

The proposed reductions affect the following mission functions and programmatic areas:

- *Fundamental Measurement, Quantum Science, and Measurement Dissemination (-$22.4 million)*
- *Exploratory Measurement Science (-$2.0 million)*
- *Advanced Manufacturing and Material Measurements (-$5.0 million)*
- *Physical Infrastructure and Resilience (-$5.0 million)*

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: Standards Coordination and Special Programs Reduction

Full-time permanent

Title		Grade	Number	Annual Salary	Total Salaries
Scientist/Engineer		ZP V	(3)	$142,701	($428,104)
Scientist/Engineer		ZP IV	(4)	121,316	(485,264)
Scientist/Engineer		ZP III	(4)	86,335	(345,338)
Management and Program Analyst		ZA IV	(4)	121,316	(485,264)
Management and Program Analyst		ZA III	(4)	86,335	(345,338)
Management and Program Analyst		ZA II	(2)	65,561	(131,123)
Administrative Support Assistant		ZS IV	(2)	53,901	(107,802)
Administrative Support Assistant		ZS III	(2)	43,798	(87,596)
Total			(25)		(2,415,830)
Less lapse	0.00%		(0)		(0)
Total full-time permanent (Positions)			(25)		(2,415,830)
2021 pay Adjustment (1.0%)					(0)
					(2,415,830)

Personnel Data Summary	
Full-time Equivalent Employment (FTE)	
Full-time permanent	(25)
Total FTE	(25)
Authorized Positions	
Full-time permanent	(25)
Total Positions	(25)

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: Standards Coordination and Special Programs Reduction

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11.1	Full-time permanent compensation	$23,001	$23,951	$24,867	$22,451	($2,416)
11.3	Other than full-time permanent	1,945	2,025	2,102	2,102	0
11.5	Other personnel compensation	620	645	670	670	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	25,566	26,621	27,639	25,223	(2,416)
12.1	Civilian personnel benefits	8,179	8,517	8,843	8,113	(730)
13	Benefits of former personnel	0	0	0	0	0
21	Travel and transportation of persons	2,648	1,648	1,648	1,494	(154)
22	Transportation of things	85	85	85	84	(1)
23	Rent, communications, utilities	0	0	0	0	0
23.3	Communications, utilities, and misc. charges	2,654	2,452	2,493	1,690	(803)
24	Printing and reproduction	84	93	95	93	(2)
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	12,508	13,103	7,082	1,446	(5,636)
25.3	Other goods and services from Federal sources	1,329	1,478	1,503	1,251	(252)
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	1,577	1,754	1,783	1,783	0
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	849	944	960	894	(66)
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	2,883	2,206	2,243	2,081	(162)
31	Equipment	1,324	973	989	845	(144)
32	Lands and structures	0	0	0	0	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	28,985	27,285	27,738	3,738	(24,000)
44	Refunds	0	0	0	0	0
99.9	Total obligations	88,671	87,159	83,101	48,735	(34,366)

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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	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11	Personnel compensation					
11.1	Full-time permanent	$270,288	$280,966	$290,022	$247,764	($42,258)
11.3	Other than full-time permanent	22,859	23,590	24,350	24,350	0
11.5	Other personnel compensation	7,272	7,272	10,207	10,207	0
11.9	**Total personnel compensation**	300,419	311,828	324,579	282,321	(42,258)
12.1	Civilian personnel benefits	93,937	105,080	114,085	101,319	(12,766)
13	Benefits for former personnel	67	67	67	67	0
21	Travel and transportation of persons	12,447	12,953	13,027	11,893	(1,134)
22	Transportation of things	846	951	970	941	(29)
23.1	Rental payments to GSA	118	118	110	110	0
23.2	Rental payments to others	1,972	2,009	2,049	2,049	0
23.3	Communications, utilities, and miscellaneous charges	19,804	23,489	23,680	20,555	(3,125)
24	Printing and reproduction	614	732	747	743	(4)
25.1	Advisory and assistance services	1,464	1,668	1,713	1,623	(90)
25.2	Other services from non-Federal sources	47,814	40,327	29,932	22,588	(7,344)
25.3	Other goods and services from Federal sources	35,936	38,937	39,795	38,316	(1,479)
25.5	Research and development contracts	42,655	45,655	46,568	29,768	(16,800)
25.7	Operation and maintenance of equipment	22,953	23,141	23,604	23,535	(69)
26	Supplies and materials	24,835	24,121	24,604	23,557	(1,047)
31	Equipment	43,646	44,366	41,173	39,254	(1,919)
32	Land and structures	18	18	18	18	0
41	Grants, subsidies, and contributions	97,270	98,520	93,520	56,120	(37,400)
42	Insurance claims and indemnities	2	0	0	0	0
43	Interest and dividends	22	0	0	0	0
99	Total Obligations	746,839	773,980	780,241	654,777	(125,464)

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
99	Total Obligations	$746,839	$773,980	$780,241	$654,777	($125,464)
	Less Prior Year Recoveries	(7,043)	0	0	0	0
	Less Prior Year Refunds	(47)	0	0	0	0
	Less Prior Year Unobligated Balance	(29,485)	(16,980)	0	0	0
	Plus Unobligated Balance, End of Year	16,980	0	0	0	0
	Plus Unobligated Balance, Expired	6	0	0	0	0
	Total Budget Authority	727,250	757,000	780,241	654,777	(125,464)
	Transfer from Election Assistance Commission	(1,250)	(1,500)	0	(1,250)	(1,250)
	Transfers from DoJ for Office of Law Enforcement Standards	(1,500)	(1,500)	0	(1,500)	(1,500)
	Appropriation	724,500	754,000	780,241	652,027	(128,214)
	Personnel Data					
	Full-time Equivalent Employment:					
	Full-time permanent	2,111	2,220	2,226	1,822	(404)
	Other than full-time permanent	266	266	266	266	0
	Total	2,377	2,486	2,492	2,088	(404)
	Authorized Positions:					
	Full-time permanent	2,479	2,508	2,508	2,110	(398)
	Other than full-time permanent	78	78	78	78	0
	Total	2,557	2,586	2,586	2,188	(398)

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	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11	Personnel compensation					
11.1	Full-time permanent	$243,699	$253,316	$261,315	$222,187	($39,128)
11.3	Other than full-time permanent	20,608	21,249	21,920	21,920	0
11.5	Other personnel compensation	6,554	6,526	9,432	9,432	0
11.9	**Total personnel compensation**	270,861	281,091	292,667	253,539	(39,128)
12.1	Civilian personnel benefits	84,511	95,277	103,907	92,086	(11,821)
13	Benefits for former personnel	67	67	67	67	0
21	Travel and transportation of persons	9,735	11,241	11,315	10,363	(952)
22	Transportation of things	709	814	833	806	(27)
23.1	Rental payments to GSA	118	118	110	110	0
23.2	Rental payments to others	1,972	2,009	2,049	2,049	0
23.3	Communications, utilities, and miscellaneous charges	16,705	20,592	20,733	18,708	(2,025)
24	Printing and reproduction	493	602	614	614	0
25.1	Advisory and assistance services	1,464	1,668	1,713	1,623	(90)
25.2	Other services from non-Federal sources	28,538	20,626	16,119	15,856	(263)
25.3	Other goods and services from Federal sources	34,607	37,459	38,292	37,065	(1,227)
25.5	Research and development contracts	41,078	43,901	44,785	27,985	(16,800)
25.7	Operation and maintenance of equipment	22,104	22,197	22,644	22,641	(3)
26	Supplies and materials	21,534	21,497	21,934	21,109	(825)
31	Equipment	38,023	39,094	35,796	35,561	(235)
32	Land and structures	18	18	18	18	0
41	Grants, subsidies, and contributions	68,285	71,235	65,782	52,382	(13,400)
42	Insurance claims and indemnities	2	0	0	0	0
43	Interest and dividends	22	0	0	0	0
99	Total Obligations	640,846	669,506	679,378	592,582	(86,796)

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
99	Total Obligations	$640,846	$669,506	$679,378	$592,582	($86,796)
	Less Prior Year Recoveries	(5,546)	0	0	0	0
	Less Prior Year Refunds	(47)	0	0	0	0
	Less Prior Year Unobligated Balance	(18,117)	(12,239)	0	0	0
	Plus Unobligated Balance, End of Year	12,239	0	0	0	0
	Plus Unobligated Balance, Expired	6	0	0	0	0
	Total Budget Authority	629,381	657,267	679,378	592,582	(86,796)
	Transfer from Election Assistance Commission	(1,250)	(1,500)	0	(1,250)	(1,250)
	Transfers from DoJ for Office of Law Enforcement Standards	0	0	0	0	0
	Appropriation	628,131	655,767	679,378	591,332	(88,046)
	Personnel Data					
	Full-time Equivalent Employment:					
	Full-time permanent	1,916	2,016	2,022	1,649	(373)
	Other than full-time permanent	241	241	241	241	0
	Total	2,157	2,257	2,263	1,890	(373)
	Authorized Positions:					
	Full-time permanent	2,249	2,275	2,275	1,908	(367)
	Other than full-time permanent	71	71	71	71	0
	Total	2,320	2,346	2,346	1,979	(367)

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	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11	Personnel compensation					
11.1	Full-time permanent	$3,588	$3,699	$3,840	$3,126	($714)
11.3	Other than full-time permanent	306	316	328	328	0
11.5	Other personnel compensation	98	101	105	105	0
11.9	**Total personnel compensation**	3,992	4,116	4,273	3,559	(714)
12.1	Civilian personnel benefits	1,247	1,286	1,335	1,120	(215)
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	64	64	64	36	(28)
22	Transportation of things	52	52	52	51	(1)
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	445	445	454	157	(297)
24	Printing and reproduction	37	37	38	36	(2)
25.1	Advisory and assistance services	0	0	0	0	0
25.2	Other services from non-Federal sources	6,768	6,598	6,731	3,786	(2,945)
25.3	Other goods and services from Federal sources	0	0	0	0	0
25.5	Research and development contracts	0	0	0	0	0
25.7	Operation and maintenance of equipment	0	0	0	0	0
26	Supplies and materials	418	418	427	367	(60)
31	Equipment	4,299	4,299	4,388	2,848	(1,540)
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	17,322	17,315	17,762	11,960	(5,802)

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
99	Total Obligations	$17,322	$17,315	$17,762	$11,960	($5,802)
	Less Prior Year Recoveries	(26)	0	0	0	0
	Less Prior Year Refunds	0	0	0	0	0
	Less Prior Year Unobligated Balance	0	(4)	0	0	0
	Plus Unobligated Balance, End of Year	4	0	0	0	0
	Plus Unobligated Balance, Expired	0	0	0	0	0
	Total Budget Authority	17,300	17,311	17,762	11,960	(5,802)
	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	17,300	17,311	17,762	11,960	(5,802)
	Personnel Data					
	Full-time Equivalent Employment:					
	Full-time permanent	24	25	25	19	(6)
	Other than full-time permanent	3	3	3	3	0
	Total	27	28	28	22	(6)
	Authorized Positions:					
	Full-time permanent	28	28	28	22	(6)
	Other than full-time permanent	1	1	1	1	0
	Total	29	29	29	23	(6)

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	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11	Personnel compensation					
11.1	Full-time permanent	$23,001	$23,951	$24,867	$22,451	($2,416)
11.3	Other than full-time permanent	1,945	2,025	2,102	2,102	0
11.5	Other personnel compensation	620	645	670	670	0
11.9	**Total personnel compensation**	25,566	26,621	27,639	25,223	(2,416)
12.1	Civilian personnel benefits	8,179	8,517	8,843	8,113	(730)
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	2,648	1,648	1,648	1,494	(154)
22	Transportation of things	85	85	85	84	(1)
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	2,654	2,452	2,493	1,690	(803)
24	Printing and reproduction	84	93	95	93	(2)
25.1	Advisory and assistance services	0	0	0	0	0
25.2	Other services from non-Federal sources	12,508	13,103	7,082	2,946	(4,136)
25.3	Other goods and services from Federal sources	1,329	1,478	1,503	1,251	(252)
25.5	Research and development contracts	1,577	1,754	1,783	1,783	0
25.7	Operation and maintenance of equipment	849	944	960	894	(66)
26	Supplies and materials	2,883	2,206	2,243	2,081	(162)
31	Equipment	1,324	973	989	845	(144)
32	Land and structures	0	0	0	0	0
41	Grants, subsidies, and contributions	28,985	27,285	27,738	3,738	(24,000)
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
99	Total Obligations	88,671	87,159	83,101	50,235	(32,866)

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
99	Total Obligations	$88,671	$87,159	$83,101	$50,235	($32,866)
	Less Prior Year Recoveries	(1,471)	0	0	0	0
	Less Prior Year Refunds	0	0	0	0	0
	Less Prior Year Unobligated Balance	(11,368)	(4,737)	0	0	0
	Plus Unobligated Balance, End of Year	4,737	0	0	0	0
	Plus Unobligated Balance, Expired	0	0	0	0	0
	Total Budget Authority	80,569	82,422	83,101	50,235	(32,866)
	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	79,069	80,922	83,101	48,735	(34,366)
	Personnel Data					
	Full-time Equivalent Employment:					
	Full-time permanent	171	179	179	154	(25)
	Other than full-time permanent	22	22	22	22	0
	Total	193	201	201	176	(25)
	Authorized Positions:					
	Full-time permanent	202	205	205	180	(25)
	Other than full-time permanent	6	6	6	6	0
	Total	208	211	211	186	(25)

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. $652,027,000, to remain available until expended, no specific authority.

3. of which not to exceed $9,000,000 may be transferred to the "Working Capital Fund." 15 U.S.C. 278b 15 U.S.C. 278b provides in part: "The National Institute of Standards and Technology is authorized to utilize in the performance of its functions the Working Capital Fund".

4. 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.

5. 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.

6. 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.

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 2019 Actual	FY 2020 Enacted	FY 2021 Estimate
Consulting Services			
Management and professional support services	$765	$695	$681
Studies, analyses, and evaluations	590	863	834
Engineering and technical services	109	110	108
Total	1,464	1,668	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.

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, 2020	99	96	$162,000	$167,362	$162,000
Less: Unobligated balance from prior year	0	0	0	(5,362)	0
2021 Adjustments to Base					
Plus: Inflationary adjustments to base	0	0	1,037	1,037	1,037
Less: Anticipated recoveries	0	0	(20,000)	(20,000)	(20,000)
Plus: Restoration of cancellation of anticipated recoveries	0	0	0	20,000	20,000
2021 Base	99	96	143,037	163,037	163,037
Less: 2021 Program changes	(81)	(80)	(137,785)	(137,785)	(137,785)
2021 Estimate	18	16	5,252	25,252	25,252

Comparison by activity with totals by activity		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease from 2021 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	$9	0	$38	0	0	0	0	0	0
Hollings Manufacturing Extension Partnership	Pos./Approp	81	140,000	81	146,000	81	$146,853	0	0	(81)	($146,853)
	FTE/Obl.	70	144,108	80	150,608	80	146,853	0	0	(80)	(146,853)
Manufacturing USA	Pos/Approp	18	15,000	18	16,000	18	16,184	18	$25,252	0	9,068
	FTE/Obl.	15	14,850	16	16,716	16	16,184	16	25,252	0	9,068
TOTALS	Pos./Approp	99	155,000	99	162,000	99	163,037	18	25,252	(81)	(137,785)
	FTE/Obl.	85	158,967	96	167,362	96	163,037	16	25,252	(80)	(137,785)
Adjustments for											
Recoveries			(2,281)		0		0		0		0
Refunds			(542)		0		0		0		0
Unobligated balance, start of year			(8,506)		(5,362)		0		0		0
Unobligated balance, end of year			5,362		0		0		0		0
Anticipated recoveries			0		0		(20,000)		(20,000)		0
Budget Authority			153,000		162,000		143,037		5,252		(137,785)
Adjustments for											
Plus restoration of cancellation of anticipated recoveries			0		0		20,000		20,000		0
Plus restoration of unobligated balances rescission			2,000		0		0		0		0
Appropriation			155,000		162,000		163,037		25,252		(137,785)

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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:			
FY 2020 pay increase and related costs	…	…	$502
FY 2021 pay increase and related costs	…	…	121
Changes in compensable days	…	…	(61)
Annualization of positions financed in FY 2020	0	0	
Awards	…	…	123
Personnel benefits:			
Civil Service Retirement System (CSRS)	…	…	(7)
Federal Employees' Retirement System (FERS)	…	…	181
Thrift Savings Plan (TSP)	…	…	2
Federal Insurance Contribution Act (FICA) - OASDI	…	…	8
Health insurance	…	…	45
Employees' Compensation Fund	…	…	(14)
Travel and transportation of persons:			
Mileage	…	…	0
Per diem	…	…	3
Communications, utilities, and miscellaneous charges:			
Postage	…	…	0
Electricity rate	…	…	3
Natural gas rate	…	…	2
General pricing level adjustment	…	…	129
Total, adjustments to base	0	0	1,037

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		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease from 2021 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	$9	0	$38	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		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Hollings Manufacturing	Pos./Approp	81	$140,000	81	$146,000	81	$146,853	0	0	(81)	($146,853)
Extension Partnership	FTE/Obl.	70	144,108	80	150,608	80	146,853	0	0	(80)	(146,853)

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 Program

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 management, 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, understanding foreign manufacturing and compliance issues, advising on cybersecurity of supply chains, and transferring technology from NIST Labs and other Federal research organizations. Last year MEP centers interacted with over 28,000 manufacturers. Through the NIST MEP client impact survey, clients reported $15.7 billion in new and retained sales, $1.5 billion in cost savings, $4.5 billion in new client investment, and helped create and retain more than 114,000 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

111,000 manufacturers, leading to $132 billion in new sales and $22 billion in cost savings, and it has helped create and retain over 1.2 million jobs.

Statement of Operating Objectives

In FY 2020, MEP advanced the initiatives highlighted below.

- Supported 8,900 client firms, including nearly 1,600 rural and over 3,100 very small manufacturers. These clients will not receive in-depth technical assistance from MEP centers in FY 2021.
- Continued the shift toward centers delivering clients more innovation service projects such as digital manufacturing and advanced robotics. As of FY 2019, more than 1 in 5 projects are innovation-related.
- Increased the share of smaller clients that receive MEP services. In FY 2019 over 58 percent of all completed projects were done with manufacturing clients with less than 50 employees.
- Executed an Interagency Agreement with the Office of the Secretary of Defense to provide awareness and technical assistance to small defense manufacturers relating to the implementation of adequate cybersecurity to protect controlled, unclassified information in defense contracts. Continued collaborating with the Department of Defense (DOD) Office of Economic Adjustment in over two dozen states across the country in order to provide supply chain services to small manufacturers impacted by DOD program changes, and to meet the increased demand for cybersecurity awareness, technical assistance, and workforce training in the DOD supply chain.
- Executed a memorandum of understanding with the Food and Drug Administration to recognize MEP centers across the Nation as local resources to provide assistance to small U.S. food processors relating to food safety practices, especially implementation of the Food Safety Modernization Act (FSMA). In addition, provided about $4.4 million in multi-year funding in FY 2018 and FY 2019 to the MEP National Network™ to address FSMA requirements through training, technical assistance, and safety in food and beverage manufacturing by small and medium sized manufacturers.

Explanation and Justification

Line Item		2019 Actual		2020 Enacted		2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Hollings Manufacturing Extension Partnership	Pos./BA	81	$140,000	81	$146,000	81	$146,853
	FTE/Obl	70	144,108	80	150,608	80	146,853

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
PROGRAM CHANGES FOR 2021
(Dollar amounts in thousands)

		2021 Base		2021 Estimate		Increase/Decrease from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Hollings Manufacturing Extension	Pos/BA	81	$146,853	0	0	(81)	($146,853)
Partnership Program	FTE/Obl.	80	146,853	0	0	(80)	(146,853)

Hollings Manufacturing Extension Partnership Program (MEP) (-$146,853, -80 FTE/-81 Positions) - The FY 2021 budget eliminates Federal funding for MEP. Should additional resources be needed to effectuate the wind-down of the program, NIST will use recoveries from prior-year obligations and unobligated balances within the Industrial Technology Services appropriation.

NIST proposes to end Federal funding for MEP. MEP centers are operated by academic/educational institutions in 18 states, State agencies in 8 states, and nonprofit organizations in 25 states. MEP centers receive funding under 5-year cooperative agreements with Federal / non-Federal cost share. No Federal funding will be provided in FY 2021 and centers will be required to change to an entirely self-supporting basis.

The proposed reduction of $146.8 million will eliminate $124.7 million in funding to MEP centers, $7 million in contracts and other support (non-labor), and $15.1 million for a 100 percent reduction of NIST MEP Federal employees that support and administer the program. The reduction will also eliminate over 1,400 non-Federal technical experts in the 51 organizations that operate the MEP program through the centers and affect over 2,100 partners in all centers and nearly 375 field offices. Almost 9,000 client firms will need to find services elsewhere, and 25 states with clients in primarily rural areas may not be able to provide alternative services.

Department of Commerce
National Institute of Standards and Technology
Hollings Manufacturing Extension Partnership Program
PROGRAM CHANGE PERSONNEL DETAIL

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

Full-time permanent

Title	Grade	Number	Annual Salary	Total Salaries
Executive Management	SES	(2)	$211,658	($423,316)
Executive Management	ZA V	(1)	189,990	(189,990)
Scientist/Engineer	ZP V	(1)	189,990	(189,990)
Scientist/Engineer	ZP IV	(1)	161,768	(161,768)
Management and Program Analyst	ZA V	(2)	189,990	(379,980)
Management and Program Analyst	ZA IV	(4)	161,768	(647,072)
Management and Program Analyst	ZA III	(12)	119,229	(1,430,748)
Management and Program Analyst	ZA II	(4)	85,306	(341,224)
Information Technology Specialist	ZP IV	(4)	177,805	(711,220)
Information Technology Specialist	ZP III	(7)	131,012	(917,084)
Economist	ZP V	(1)	189,990	(189,990)
Economist	ZP IV	(2)	177,805	(355,610)
Industrial Specialist	ZA V	(3)	189,990	(569,970)
Industrial Specialist	ZA IV	(20)	162,719	(3,254,380)
Industrial Specialist	ZA III	(3)	131,012	(393,036)
Administrative Support	ZS V	(2)	95,070	(190,140)
Administrative Support	ZS IV	(3)	78,231	(234,693)
Administrative Support	ZS IV	(2)	73,309	(146,618)
Administrative Support	ZS III	(7)	66,453	(465,171)
Total		(81)		(11,192,000)

Total full-time permanent (Positions)	(81)	($11,192,000)
2021 pay Adjustment (0.0%)		0
		(11,192,000)

Personnel Data Summary

Full-time Equivalent Employment (FTE)	
Full-time permanent	(80)
Total FTE	(80)
Authorized Positions	
Full-time permanent	(81)
Total Positions	(81)

Department of Commerce
National Institute of Standards and Technology
Hollings Manufacturing Extension Partnership Program
PROGRAM CHANGE DETAIL BY OBJECT CLASS
(Direct Obligations amounts in thousands)

Activity: Hollings Manufacturing Extension Partnership Program

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11.1	Full-time permanent compensation	$8,363	$9,868	$10,187	0	($10,187)
11.3	Other than full-time permanent	694	707	730	0	(730)
11.5	Other personnel compensation	173	173	275	0	(275)
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	9,230	10,748	11,192	0	(11,192)
12.1	Civilian personnel benefits	2,924	3,659	3,973	0	(3,973)
13	Benefits for former personnel	2	2	2	0	(2)
21	Travel and transportation of persons	353	361	363	0	(363)
22	Transportation of things	5	5	5	0	(5)
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	5	0	0	0	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and misc. charges	661	701	706	0	(706)
24	Printing and reproduction	9	9	9	0	(9)
25	Other contractual services	0	0	0	0	0
25.1	Advisory and assistance services	246	232	232	0	(232)
25.2	Other services from non-Federal sources	3,807	3,886	3,955	0	(3,955)
25.3	Other goods and services from Federal sources	849	854	857	0	(857)
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	416	418	426	0	(426)
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	147	150	153	0	(153)
31	Equipment	265	268	273	0	(273)
32	Lands and structures	0	0	0	0	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	125,188	129,315	124,707	0	(124,707)
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	144,108	150,608	146,853	0	(146,853)

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		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Manufacturing USA	Pos./Approp	18	$15,000	18	$16,000	18	$16,184	18	$25,252	0	$9,068
	FTE/Obl.	15	14,850	16	16,716	16	16,184	16	25,252	0	9,068

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. Another major goal is workforce training in new and advanced technology, including helping veterans to enter the manufacturing workforce.

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 one-time Federal startup funding plus matching non-Federal funds over a 5 to 7-year period, after which Institutes are self-sustaining. The Institutes form a network for manufacturing innovation with common goals, but unique technical concentrations that can benefit an entire industry sector. In the institutes, industry, academia, and government partners leverage existing resources, collaborate, and co-invest to nurture manufacturing innovation and accelerate commercialization. As 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. Institutes draw together the best talents and capabilities from all the partners to build the proving grounds where innovations flourish and help advance American domestic manufacturing. 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 budget request of $16.2 million in funds to continue program coordination and network support of Manufacturing USA institutes ($5 million, for the network currently standing at 15 institutes) and to continue the role of a Department of Commerce (DOC) sponsored institute ($11.2 million) authorized by the Revitalize American Manufacturing and Innovation Act. The total request is $25.2 million, including funds for a second DOC institute.

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

Statement of Operating Objectives

As part of efforts to revitalize U.S. manufacturing, NIST proposed and Congress authorized 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 self-sustaining regional manufacturing hubs that have national impact. The Institutes help support an ecosystem of manufacturing activity in regions of the U.S. 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 the manufacturing process technologies.

Explanation and Justification

Line Item		2019 Actual		2020 Enacted		2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Manufacturing USA	Pos./BA	18	$15,000	18	$16,000	18	$16,184
	FTE/Obl	15	14,850	16	16,716	16	16,184

The FY 2021 base funding is $16.2 million for the Manufacturing USA program: $5 million for coordination of the network of manufacturing institutes and $11.2 million to help establish and support a second DOC Manufacturing USA institute. With this level (along with a program increase requested) NIST will be able to sponsor a new institute with a 5 to 7-year, $70 million - $120 million cooperative agreement requiring at least 100 percent non-Federal cost share.

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
PROGRAM CHANGES FOR 2021
(Dollar amounts in thousands)

		2021 Base		2021 Estimate		Increase/Decrease from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Manufacturing USA	Pos/BA	18	$16,184	18	$25,252	0	$9,068
	FTE/Obl.	16	16,184	16	25,252	0	9,068

Fund an Additional DOC Manufacturing USA Institute (+$9,068, 0 FTE/0 Positions) - This request will fund an additional Manufacturing USA Institute. The request will help expand Manufacturing USA, which was created by Congress to strengthen U.S. manufacturing. The program is designed to meet broad industry needs across sectors, with priority given to national advanced manufacturing needs, such as artificial intelligence, cybersecurity, and quantum information. 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 transformative manufacturing technologies, along with addressing workforce skills gaps in these emerging technologies.

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 emphasizes outreach and engagement with small and medium sized manufacturing enterprises. With the increased funding, Department of Commerce (DOC) will be able to establish an additional industry-driven Innovation Institute. 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.

NIST is required by Congress to convene, support, and coordinate the network of all Manufacturing USA Institutes, including eight Department of Defense and five Department of Energy Institutes. Manufacturing USA is specified in the White House Strategy for American Leadership in Advanced Manufacturing (2018) as the means for achieving many of the key national objectives necessary for the U.S. to maintain a competitive manufacturing sector. Failure to maintain support for this initiative could lead to a loss of U.S. competitiveness in this sector as other countries are increasingly adept at technology transfer and scaling to production.

The $9 million increase, along with about $11 million from base funds, will allow the program to compete and fund one new open-topic Institute for $20 million beginning in FY 2021.

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

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11.1	Full-time permanent compensation	$1,957	$2,141	$2,209	$2,209	0
11.3	Other than full-time permanent	173	176	182	182	0
11.5	Other personnel compensation	43	43	64	64	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	2,173	2,360	2,455	2,455	0
12.1	Civilian personnel benefits	651	768	830	830	0
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	103	161	162	165	$3
22	Transportation of things	5	5	5	5	0
23	Rent, communications, and utilities	0	0	0	0	0
23.1	Rental payments to GSA	0	5	4	4	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and misc. charges	125	132	133	194	61
24	Printing and reproduction	5	5	5	5	0
25	Other contractual services					
25.1	Advisory and assistance services	16	270	320	320	0
25.2	Other services from non-Federal sources	699	1,321	572	666	94
25.3	Other goods and services from Federal	154	154	155	168	13
25.4	Operation and maintenance of facilities	0	0	0	0	0
25.5	Research and development contracts	8	8	8	8	0
25.6	Medical care	0	0	0	0	0
25.7	Operation and maintenance of equipment	192	192	196	197	1
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	52	52	54	61	7
31	Equipment	67	67	69	70	1
32	Lands and structures	0	0	0	0	0
33	Investments and loans	0	0	0	0	0
41	Grants, subsidies and contributions	10,600	11,216	11,216	20,104	8,888
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	14,850	16,716	16,184	25,252	9,068

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

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11	Personnel compensation					
11.1	Full-time permanent	$10,320	$12,009	$12,396	$2,209	($10,187)
11.3	Other than full-time permanent	867	883	912	182	(730)
11.5	Other personnel compensation	216	216	339	64	(275)
11.9	**Total personnel compensation**	11,403	13,108	13,647	2,455	(11,192)
12.1	Civilian personnel benefits	3,575	4,427	4,803	830	(3,973)
13	Benefits for former personnel	2	2	2	0	(2)
21	Travel and transportation of persons	456	522	525	165	(360)
22	Transportation of things	10	10	10	5	(5)
23.1	Rental payments to GSA	5	5	4	4	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and miscellaneous charges	786	833	839	194	(645)
24	Printing and reproduction	14	14	14	5	(9)
25.1	Advisory and assistance services	262	502	552	320	(232)
25.2	Other services from non-Federal sources	4,515	5,245	4,527	666	(3,861)
25.3	Other goods and services from Federal sources	1,003	1,008	1,012	168	(844)
25.5	Research and development contracts	8	8	8	8	0
25.7	Operation and maintenance of equipment	608	610	622	197	(425)
26	Supplies and materials	199	202	207	61	(146)
31	Equipment	332	335	342	70	(272)
32	Land and structures	0	0	0	0	0
41	Grants, subsidies, and contributions	135,788	140,531	135,923	20,104	(115,819)
43	Interest and dividends	1	0	0	0	0
99	Total Obligations	158,967	167,362	163,037	25,252	(137,785)

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
99	Total Obligations	$158,967	$167,362	$163,037	$25,252	($137,785)
	Prior year recoveries	(2,281)	0		0	0
	Less prior year refunds	(542)	0	0	0	0
	Less prior year unobligated balance	(8,506)	(5,362)	0	0	0
	Plus unobligated balance end of year	5,362	0		0	0
	Anticipated recoveries	0	0	(20,000)	(20,000)	0
	Total Budget Authority	153,000	162,000	143,037	5,252	(137,785)
	Plus restoration of cancellation of anticipated recoveries	0	0	20,000	20,000	0
	Plus restoration of unobligated balances rescission	2,000 *	0	0	0	0
	Total Appropriation	155,000	162,000	163,037	25,252	(137,785)

* Unobligated balances rescission of $2 million from TIP ($1,906K) and MEP ($94K) carryover.

Personnel Data

Full-time equivalent employment:					
Full-time permanent	75	86	86	14	(72)
Other than full-time permanent	10	10	10	2	(8)
Total	85	96	96	16	(80)
Authorized Positions:					
Full-time permanent	89	89	89	16	(73)
Other than full-time permanent	10	10	10	2	(8)
Total	99	99	99	18	(81)

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	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11	Personnel compensation					
11.1	Full-time permanent	$8,363	$9,868	$10,187	0	($10,187)
11.3	Other than full-time permanent	694	707	730	0	(730)
11.5	Other personnel compensation	173	173	275	0	(275)
11.9	**Total personnel compensation**	9,230	10,748	11,192	0	(11,192)
12.1	Civilian personnel benefits	2,924	3,659	3,973	0	(3,973)
13	Benefits for former personnel	2	2	2	0	(2)
21	Travel and transportation of persons	353	361	363	0	(363)
22	Transportation of things	5	5	5	0	(5)
23.1	Rental payments to GSA	5	0	0	0	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and miscellaneous charges	661	701	706	0	(706)
24	Printing and reproduction	9	9	9	0	(9)
25.1	Advisory and assistance services	246	232	232	0	(232)
25.2	Other services from non-Federal sources	3,807	3,886	3,955	0	(3,955)
25.3	Other goods and services from Federal sources	849	854	857	0	(857)
25.5	Research and development contracts	0	0	0	0	0
25.7	Operation and maintenance of equipment	416	418	426	0	(426)
26	Supplies and materials	147	150	153	0	(153)
31	Equipment	265	268	273	0	(273)
32	Land and structures	0	0	0	0	0
41	Grants, subsidies, and contributions	125,188	129,315	124,707	0	(124,707)
43	Interest and dividends	1	0	0	0	0
99	Total Obligations	144,108	150,608	146,853	0	(146,853)

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
99	Total Obligations	$144,108	$150,608	$146,853	0	($146,853)
	Less prior year recoveries	(2,086)	0	0	0	0
	Less prior year refunds	(259)	0	0	0	0
	Less prior year unobligated balance	(6,465)	(4,608)	0	0	0
	Plus unobligated balance end of year	4,608	0	0	0	0
	Less anticipated recoveries	0	0	(20,000)	(20,000)	0
	Total Budget Authority	139,906	146,000	126,853	(20,000)	(146,853)
	Plus restoration of cancellation of anticipated recoveries	0	0	20,000	20,000	0
	Plus restoration of unobligated balances rescission	94	0	0	0	0
	Total Appropriation	140,000	146,000	146,853	0	(146,853)
	Personnel Data					
	Full-time equivalent employment:					
	Full-time permanent	62	72	72	0	(72)
	Other than full-time permanent	8	8	8	0	(8)
	Total	70	80	80	0	(80)
	Authorized Positions:					
	Full-time permanent	73	73	73	0	(73)
	Other than full-time permanent	8	8	8	0	(8)
	Total	81	81	81	0	(81)

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	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11	Personnel compensation					
11.1	Full-time permanent	$1,957	$2,141	$2,209	$2,209	0
11.3	Other than full-time permanent	173	176	182	182	0
11.5	Other personnel compensation	43	43	64	64	0
11.9	**Total personnel compensation**	2,173	2,360	2,455	2,455	0
12.1	Civilian personnel benefits	651	768	830	830	0
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	103	161	162	165	$3
22	Transportation of things	5	5	5	5	0
23.1	Rental payments to GSA	0	5	4	4	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and miscellaneous charges	125	132	133	194	61
24	Printing and reproduction	5	5	5	5	0
25.1	Advisory and assistance services	16	270	320	320	0
25.2	Other services from non-Federal sources	699	1,321	572	666	94
25.3	Other goods and services from Federal sources	154	154	155	168	13
25.5	Research and development contracts	8	8	8	8	0
25.7	Operation and maintenance of equipment	192	192	196	197	1
26	Supplies and materials	52	52	54	61	7
31	Equipment	67	67	69	70	1
32	Land and structures	0	0	0	0	0
41	Grants, subsidies, and contributions	10,600	11,216	11,216	20,104	8,888
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	0	0	0	0	0
99	Total Obligations	14,850	16,716	16,184	25,252	9,068

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
99	Total Obligations	$14,850	$16,716	$16,184	$25,252	$9,068
	Less prior year recoveries	(175)	0	0	0	0
	Less Prior Year Refunds	(7)	0	0	0	0
	Less prior year unobligated balance	(384)	(716)	0	0	0
	Plus unobligated balance end of year	716	0	0	0	0
	Total Budget Authority/Appropriation	15,000	16,000	16,184	25,252	9,068
	Personnel Data					
	Full-time equivalent employment:					
	Full-time permanent	13	14	14	14	0
	Other than full-time permanent	2	2	2	2	0
	Total	15	16	16	16	0
	Authorized Positions:					
	Full-time permanent	16	16	16	16	0
	Other than full-time permanent	2	2	2	2	0
	Total	18	18	18	18	0

Department of Commerce
National Institute of Standards and Technology
Industrial Technology Services
JUSTIFICATION OF PROPOSED LANGUAGE CHANGES

FY 2021

The following language is proposed in the general provisions for the Department of Commerce to cancel amounts from prior year appropriations:

SEC 515 (a) Of the unobligated balances from prior year appropriations available to the Department of Commerce, the following funds are hereby cancelled, not later than September 30, 2021, from the following accounts in the specified amounts-

(3) “National Institute of Standards and Technology, Industrial Technology Services”, $20,000,000.

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. $25,252,000 is provided for the Manufacturing USA program to remain available until expended.

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)."

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

	FY 2019 Actual	FY 2020 Enacted	FY 2021 Estimate
Consulting Services			
Management and professional support services	$61	$27	$20
Studies, analyses, and evaluations	201	275	250
Engineering and technical services	0	200	50
Total	262	502	320

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.

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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, 2020	116	110	$118,000	$371,979	$118,000
Less: Unobligated balance from prior year	0	0	0	(253,979)	0
2021 Adjustments to Base					
Plus: Inflationary adjustments to base	0	0	2,180	2,180	2,180
2021 Base	116	110	120,180	120,180	120,180
Less: 2021 Program changes	0	0	(59,936)	(59,936)	(59,936)
2021 Estimate	116	110	60,244	60,244	60,244

Comparison by activity/subactivity with totals by activity		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Construction and Major Renovations											
Construction and Major	Pos/Approp	116	$106,000	116	$118,000	116	$120,180	116	$60,244	0	($59,936)
Renovations	FTE/Obl.	100	118,970	110	371,979	110	120,180	110	60,244	0	(59,936)
Adjustments for											
Recoveries			(1,077)		0		0		0		0
Refunds			(51)		0		0		0		0
Unobligated balance, start of year			(265,821)		(253,979)		0		0		0
Unobligated balance, end of year			253,979		0		0		0		0
Budget Authority/Appropriation			106,000		118,000		120,180		60,244		(59,936)

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		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease from 2021 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	$1,122	0	$778	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)

	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
Total Obligations	$120,092	$372,757	$120,180	$60,244	($59,936)
Offsetting collections from:					
Non-Federal sources	(778)	0	0	0	0
Total offsetting collections	(778)	0	0	0	0
Recoveries (Direct)	(1,077)	0	0	0	0
Prior year recoveries (Reimbursable)	(216)	0	0	0	0
Refunds (Direct)	(51)	0	0	0	0
Unobligated balance, start of year (Direct)	(265,821)	(253,979)	0	0	0
Unobligated balance, start of year (Reimbursable)	(906)	(778)	0	0	0
Unobligated balance, end of year (Direct)	253,979	0	0	0	0
Unobligated balance, end of year (Reimbursable)	778	0	0	0	0
Budget Authority/Appropriation	106,000	118,000	120,180	60,244	(59,936)

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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:			
FY 2020 pay increase and related costs	…	…	$419
FY 2021 pay increase and related costs	…	…	101
Changes in compensable days	…	…	(51)
Annualization of positions financed in FY 2020	0	0	
Awards	…	…	107
Personnel benefits:			
Civil Service Retirement System (CSRS)	…	…	(7)
Federal Employees' Retirement System (FERS)	…	…	153
Thrift Savings Plan (TSP)	…	…	2
Federal Insurance Contribution Act (FICA) - OASDI	…	…	9
Health insurance	…	…	38
Employees' Compensation Fund	…	…	(10)
Travel and transportation of persons:			
Mileage	…	…	0
Per diem	…	…	0
Communications, utilities, and miscellaneous charges:			
Postage	…	…	0
Electricity rate	…	…	0
Natural gas rate	…	…	0
General pricing level adjustment	…	…	1,419
Total, adjustments to base	0	0	2,180

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		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Construction and Major Renovations	Pos/Approp	8	$31,000	0	$43,000	0	$43,000	0	$19,600	0	($23,400)
	FTE/Obl.	7	74,103	0	219,079	0	43,000	0	19,600	0	(23,400)
Safety, Capacity, Maintenance and Major Repairs	Pos/Approp	108	75,000	116	75,000	116	77,180	116	40,644	0	(36,536)
	FTE/Obl.	93	44,865	110	152,027	110	77,180	110	40,644	0	(36,536)
External Projects	Pos/Approp	0	0	0	0	0	0	0	0	0	0
	FTE/Obl.	0	2	0	873	0	0	0	0	0	0
Total	Pos/Approp	116	106,000	116	118,000	116	120,180	116	60,244	0	(59,936)
	FTE/Obl.	100	118,970	110	371,979	110	120,180	110	60,244	0	(59,936)

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		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease from 2021 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	$1,122	0	$778	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	1,122	0	778	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 facilities 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 some improvements have been made with the occasional construction funding that has been received for major facility projects, the current state of facilities and infrastructure continues to be a serious impediment to NIST's ability to conduct advanced measurement science and research. Competing budget priorities resulted in NIST to limit investments toward operation and maintenance of existing physical infrastructure.

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 roofs;
- Refurbishment of elevators;
- 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 aging and failing electrical distribution systems to provide safe working conditions and to accommodate current and expanding research capacity requirements;
- 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;
- Repair leaks and address the deterioration of underground potable water, sewer, electrical feeder, and compressed air systems;
- 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;
- 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."[2] The infrastructure of NIST's Boulder and Gaithersburg campuses is 50 to 60 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 work would cease.

NIST's current facilities backlog includes $603.2 million in buildings and $171.2 million in site utilities and infrastructure. Numerous major utility infrastructure systems are currently in critical condition, creating risks of catastrophic failure of entire laboratory buildings. The Gaithersburg campus is currently losing over 65,000 gallons of water per day in the steam system due primarily to degrading pipes. 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. In Gaithersburg, one of the main electrical feeder splices exploded in a manhole and had the potential to take out the electrical feeds to numerous laboratory buildings. 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. In Boulder, there have been three unplanned power outages due to the $12 million campus high-speed electrical switch which is failing and will no longer be supported by the manufacturer after 2019. 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.

A constrained fiscal environment for NIST's SCMMR program has caused NIST's facilities to become non-compliant with DOC's Facility Condition Index (FCI) recommendations.[3] Specifically, 65 percent of NIST's facilities have not been renovated or newly constructed in the last 20 years and therefore those facilities have seen a dramatic drop in FCI values over the last several years. Of these facilities, the overall FCI value for mission-critical facilities has declined to 78 in Gaithersburg and 51 in Boulder which is well below DOC's recommended value of 90 and places them in an unacceptable condition. The FCI values for NIST's mission-dependent facilities are also similarly below the DOC recommended minimum value. The declining condition of the facilities shows a strong justification for increasing SCMMR funding in excess of the National Research Council guidelines over several years until the facilities can be brought back above the minimum FCI 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

[2] National Research Council. 1990. Committing to the Cost of Ownership: Maintenance and Repair of Public Buildings. Washington, D.C.: National Academy Press.
[3] U.S. Department of Commerce Real Property Management Manual Second Edition dated March 2017, Paragraph 4.4.3 Building Conditions (Page 47).

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. This funding level for SCMMR would be in the range of $115 million to $144 million.

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, 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,
  - Begin site infrastructure 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 2019 and Prior	FY 2020	FY 2021	FY 2022	Cost to Complete
Building 1 Renovation (B1R) Design and Limited Renovation of Building 3	$12.0				
B1R Exterior Renovations	14.9				
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 *	103.0	$43.0^			
Remaining Components of Building 1: Wing 1, Wing 2, and Headhouse *					
Building 245 Modernization	327.0				

* Will be completed, including Furniture, Fixtures and Equipment (FF&E), with $294 million from the General Services Administration (GSA) Federal Capital Revolving Fund (FCRF) as proposed in the FY 2021 President's budget.

^ In FY 2020, $43 million completes Wing 5 and includes FF&E.

Explanation and Justification

Line Item		2019 Actual		2020 Enacted		2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Construction and Major Renovations	Pos./BA	8	$31,000	0	$43,000	0	$43,000
	FTE/Obl	7	74,103	0	219,079	0	43,000
Safety, Capacity, Maintenance And Major Repairs	Pos./BA	108	75,000	116	75,000	116	77,180
	FTE/Obl	93	44,865	110	152,027	110	77,180
External Projects	Pos./BA	0	0	0	0	0	0
	FTE/Obl	0	2	0	873	0	0
Total	Pos./BA	116	106,000	116	118,000	116	120,180
	FTE/Obl	100	118,970	110	371,979	110	120,180

Construction of Research Facilities (Total Funding: $120.2 million and 116 Positions)

With SCMMR base funding, NIST will 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 will include timing, phasing, and budget estimates for each project. The contractor has conducted a lengthy analysis of each campus and the associated master plan. As of January 2020, they are currently developing implementation plans for each campus. These plans will be presented to NIST leadership for review and approval. Once approved, the contractor will develop a combined implementation plan for presentation to NIST leadership for review and approval. It is projected that the Implementation Plan will be finalized in late FY 2020. In the interim, NIST will gladly provide updates on the progress on the development of the plan.[4]

[4] 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 2021
(Dollar amounts in thousands)

		2021 Base		2021 Estimate		Increase/Decrease from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Construction and major	Pos/BA	0	0	0	$19,600	0	$19,600
renovations	FTE/Obl.	0	0	0	19,600	0	19,600

GSA Federal Capital Revolving Fund annual payments increase ($19,600, 0 FTE/0 Positions) - The 2021 budget request proposes: (1) to create a FCRF to fund large-dollar, Federally-owned, civilian real property capital projects; and (2) provide specific budget enforcement rules for the FCRF that would allow it to function, in effect, like State and local government capital budgets. The FCRF will be housed in the GSA. This proposal incorporates principles that are central to the success of capital budgeting at the State and local level -- a limit on total funding for capital investment, annual decisions on the allocation of funding for capital projects and spreading the acquisition cost over 15 years in the discretionary operating budgets of agencies that purchase the assets.

The 2021 Budget proposes to use the FCRF concept to fund the renovation of NIST's Building 1 in Boulder, Colorado, estimated at $294 million including furniture, fixtures and equipment. In accordance with the principles and design of the FCRF, the 2021 budget requests appropriations language designating NIST's renovation as a project to be funded out of the FCRF along with 1/15 of the purchase price, or $19.6 million, for the first-year repayment back to the FCRF.

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	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11.1	Full-time permanent compensation	0	0	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
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	0	0	0	0	0
12.1	Civilian personnel benefits	0	0	0	0	0
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	0	0	0	0	0
22	Transportation of things	0	0	0	0	0
23	Rent, communications, and utilities					
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 misc. charges	0	0	0	0	0
24	Printing and reproduction	0	0	0	0	0
25	Other contractual services					
25.1	Advisory and assistance services	0	0	0	0	0
25.2	Other services from non-Federal sources	0	0	0	0	0
25.3	Other goods and services from Federal sources	0	0	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	0	0	0	0	0
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	0	0	0	0	0
31	Equipment	0	0	0	0	0
32	Lands and structures	0	0	0	$19,600	$19,600
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	1	1	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	0	0	0	19,600	19,600

Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
PROGRAM CHANGES FOR 2021
(Dollar amounts in thousands)

		2021 Base		2021 Estimate		Increase/Decrease from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Safety, Capacity, Maintenance	Pos/BA	116	$77,180	116	$40,644	0	($36,536)
and Major Repairs	FTE/Obl.	110	77,180	110	40,644	0	(36,536)

Safety, Capacity, Maintenance and Major Repairs reduction (-$36,536, 0 FTE/0 Positions) - At the FY 2021 reduced base funding level, NIST would defer SCMMR projects from FY 2021 to FY 2022 to include critical site and facility infrastructure projects necessary for routine facility operations. The request of $40.6 million will primarily fund annual fixed costs for salaries, recurring contracts, capital asset management, and planning/support costs. Funds would be realigned to address high priority emergency projects that may arise unexpectedly.

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	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11.1	Full-time permanent compensation	$9,554	$10,711	$11,058	$11,058	0
11.3	Other than full-time permanent	0	0	0	0	0
11.5	Other personnel compensation	515	515	622	622	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	10,069	11,226	11,680	11,680	0
12.1	Civilian personnel benefits	3,050	3,673	3,980	3,980	0
13	Benefits for former personnel	2	2	2	2	0
21	Travel and transportation of persons	21	21	21	21	0
22	Transportation of things	16	16	16	16	0
23	Rent, communications, and utilities					
23.1	Rental payments to GSA	2	2	2	2	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and misc. charges	82	82	82	82	0
24	Printing and reproduction	6	6	6	6	0
25	Other contractual services					
25.1	Advisory and assistance services	58	750	750	750	0
25.2	Other services from non-Federal sources	27,070	125,966	58,021	21,485	($36,536)
25.3	Other goods and services from Federal sources	134	134	135	135	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	817	817	834	834	0
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	1,147	1,147	1,170	1,170	0
31	Equipment	197	7,197	481	481	0
32	Lands and structures	76,298	177,241	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	1	0	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	118,970	328,979	77,180	40,644	(36,536)

Department of Commerce
National Institute of Standards and Technology
Construction of Research Facilities
PROGRAM CHANGES FOR 2021
(Dollar amounts in thousands)

		2021 Base		2021 Estimate		Increase/Decrease from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
Construction and major	Pos/BA	0	$43,000	0	0	0	($43,000)
renovations	FTE/Obl.	0	43,000	0	0	0	(43,000)

Building 1 Renovation decrease (-$43,000, 0 FTE/0 Positions) - NIST requests a decrease in the amount off $43 million to reflect the one-time construction drop out for the Building 1 renovation project.

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	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11.1	Full-time permanent compensation	0	0	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
11.8	Special personnel services payments	0	0	0	0	0
11.9	Total personnel compensation	0	0	0	0	0
12.1	Civilian personnel benefits	0	0	0	0	0
13	Benefits for former personnel	0	0	0	0	0
21	Travel and transportation of persons	0	0	0	0	0
22	Transportation of things	0	0	0	0	0
23	Rent, communications, and utilities					
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 misc. charges	0	0	0	0	0
24	Printing and reproduction	0	0	0	0	0
25	Other contractual services					
25.1	Advisory and assistance services	0	0	0	0	0
25.2	Other services from non-Federal sources	0	0	0	0	0
25.3	Other goods and services from Federal sources	0	0	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	0	0	0	0	0
25.8	Subsistence and support of persons	0	0	0	0	0
26	Supplies and materials	0	0	0	0	0
31	Equipment	0	$11,000	$11,000	0	($11,000)
32	Lands and structures	0	32,000	32,000	0	(32,000)
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	1	1	0	0	0
44	Refunds	0	0	0	0	0
99.9	Total obligations	0	43,000	43,000	0	(43,000)

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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	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/(Decrease) from 2021 Base
11	Personnel compensation					
11.1	Full-time permanent	$9,554	$10,711	$11,058	$11,058	0
11.3	Other than full-time permanent	0	0	0	0	0
11.5	Other personnel compensation	515	515	622	622	0
11.9	**Total personnel compensation**	10,069	11,226	11,680	11,680	0
12.1	Civilian personnel benefits	3,050	3,673	3,980	3,980	0
13	Benefits for former personnel	2	2	2	2	0
21	Travel and transportation of persons	21	21	21	21	0
22	Transportation of things	16	16	16	16	0
23.1	Rental payments to GSA	2	2	2	2	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and miscellaneous charges	82	82	82	82	0
24	Printing and reproduction	6	6	6	6	0
25.1	Advisory and assistance services	58	750	750	750	0
25.2	Other services from non-Federal sources	27,070	125,966	58,021	21,485	($36,536)
25.3	Other goods and services from Federal sources	134	134	135	135	0
25.5	Research and development contracts	0	0	0	0	0
25.7	Operation and maintenance of equipment	817	817	834	834	0
26	Supplies and materials	1,147	1,147	1,170	1,170	0
31	Equipment	197	18,197	11,481	481	(11,000)
32	Land and structures	76,298	209,241	32,000	19,600	(12,400)
41	Grants, subsidies, and contributions	0	699	0	0	0
43	Interest and dividends	1	0	0	0	0
99	Total Obligations	118,970	371,979	120,180	60,244	(59,936)

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/(Decrease) from 2021 Base
99	Total Obligations	$118,970	$371,979	$120,180	$60,244	($59,936)
	Less prior year recoveries	(1,077)	0	0	0	0
	Less prior year refunds	(51)	0	0	0	0
	Less prior year unobligated balance	(265,821)	(253,979)	0	0	0
	Plus unobligated balance end of year	253,979	0	0	0	0
	Total Budget Authority/Appropriation	106,000	118,000	120,180	60,244	(59,936)
	Personnel Data					
	Full-time equivalent employment:					
	Full-time permanent	100	110	110	110	0
	Other than full-time permanent	0	0	0	0	0
	Total	100	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. $60,244,000 to remain available until expended.

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 2019 Actual	FY 2020 Enacted	FY 2021 Estimate
Consulting Services			
Management and professional support services	$58	$750	$750
Studies, analyses, and evaluations	0	0	0
Engineering and technical services	0	0	0
Total	58	750	750

Significant Activities

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.

Exhibit 5

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, 2020	686	686	0	0
Reduction in transfers from prior STRS program changes	0	0	0	0
2021 Base	686	686	0	0
Transfer from STRS program changes for equipment investments	0	0	0	0
2021 Estimate	686	686	0	0

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

	2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease from 2021 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	564	$138,154	643	$136,033	643	$132,983	643	$132,983	0	0
WCF investments	0	9,544	0	(2)	0	0	0	0	0	0
Subtotal	564	147,698	643	136,031	643	132,983	643	132,983	0	0
Corporate Services										
WCF transfer		0		0		0		0		0
Reimbursables	13	3,881	13	5,139	13	5,380	13	5,380	0	0
WCF investments	0	(79)	0	(2,676)	0	0	0	0	0	0
Subtotal	13	3,802	13	2,463	13	5,380	13	5,380	0	0
Standards Coordination and Special Programs [1/]										
WCF transfer		0		0		0		0		0
Reimbursables	30	9,425	30	11,428	30	10,275	30	10,275	0	0
WCF investments	0	(100)	0	(105)	0	0	0	0	0	0
Subtotal	30	9,325	30	11,323	30	10,275	30	10,275	0	0
Manufacturing USA										
WCF transfer		0		0		0		0		0
Reimbursables	0	0	0	0	0	0	0	0	0	0
WCF investments	0	(6)	0	(6)	0	0	0	0	0	0
Subtotal	0	(6)	0	(6)	0	0	0	0	0	0
Hollings Manufacturing Extension Partnership										
WCF transfer		0		0		0		0		0
Reimbursables	0	2,277	0	1,399	0	500	0	500	0	0
WCF investments	0	(30)	0	(30)	0	0	0	0	0	0
Subtotal	0	2,247	0	1,369	0	500	0	500	0	0

	2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease from 2021 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	607	$153,737	686	$153,999	686	$149,138	686	$149,138	0	0
WCF investments	0	9,329	0	(2,819)	0	0	0	0	0	0
Grand Total	607	163,066	686	151,180	686	149,138	686	149,138	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)

	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
Total Obligations	$163,066	$151,180	$149,138	$149,138	0
Offsetting collections from:					
Federal funds	(138,682)	(94,701)	(92,227)	(92,227)	0
Non-Federal sources	(52,663)	(56,479)	(56,911)	(56,911)	0
Unobligated balance, start of year	(133,548)	(154,951)	(154,951)	(154,951)	0
Unobligated balance, end of year	154,951	154,951	154,951	154,951	0
Change in uncollected customer payments - Federal	6,876	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		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
Laboratory Programs	Pos./BA	625	$147,698	643	$136,031	643	$132,983	643	$132,983	0	0
	FTE/Obl.	564	147,698	643	136,031	643	132,983	643	132,983	0	0
Corporate Services	Pos./BA	20	3,802	13	2,463	13	5,380	13	5,380	0	0
	FTE/Obl.	13	3,802	13	2,463	13	5,380	13	5,380	0	0
Standards Coordination	Pos./BA	41	9,325	30	11,323	30	10,275	30	10,275	0	0
and Special Programs [1/]	FTE/Obl.	30	9,325	30	11,323	30	10,275	30	10,275	0	0
Manufacturing USA	Pos./BA	0	(6) [2/]	0	(6) [2/]	0	0	0	0	0	0
	FTE/Obl.	0	(6) [2/]	0	(6) [2/]	0	0	0	0	0	0
Hollings Manufacturing	Pos./BA	0	2,247	0	1,369	0	500	0	500	0	0
Extension Partnership	FTE/Obl.	0	2,247	0	1,369	0	500	0	500	0	0
WCF investments	Pos./BA	686	163,066	686	151,180	686	149,138	686	149,138	0	0
Total	FTE/Obl.	607	163,066	686	151,180	686	149,138	686	149,138	0	0

[1/] Includes Baldrige Performance Excellence Program (BPEP).
[2/] Negative amount as a result of amortizatized repayment of Invested Equipment (IE) higher than the IE purchases allocated to this subactivity.

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 (FTE) employment and reimbursable obligations associated with the reimbursable work performed by NIST for other agencies and 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 (SRMs) and Baldrige Performance Excellence Program (BPEP) 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: (1) the need for traceability of measurements to national standards; (2) the need for work which cannot or will not be addressed by the private sector; (3) work supported by legislation that authorizes or mandates certain services; (4) work which would result in an unavoidable conflict of interest if carried out by the private sector or regulatory agencies; and (5) 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	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11	Personnel compensation					
11.1	Full-time permanent	$58,766	$60,411	$61,333	$61,333	0
11.3	Other than full-time permanent	4,974	4,974	4,974	4,974	0
11.5	Other personnel compensation	858	858	858	858	0
11.9	**Total personnel compensation**	64,598	66,243	67,165	67,165	0
12.1	Civilian personnel benefits	20,292	20,538	20,690	20,690	0
13	Benefits for former personnel	15	15	15	15	0
21	Travel and transportation of persons	1,595	1,215	1,125	1,125	0
22	Transportation of things	352	268	248	248	0
23.1	Rental payments to GSA	27	27	27	27	0
23.2	Rental payments to others	0	0	0	0	0
23.3	Communications, utilities, and miscellaneous charges	4,066	3,993	3,975	3,975	0
24	Printing and reproduction	165	126	116	116	0
25.1	Advisory and assistance services	1,431	886	887	887	0
25.2	Other services from non-Federal sources	15,751	12,001	11,117	11,117	0
25.3	Other goods and services from Federal sources	5,999	5,666	5,588	5,588	0
25.5	Research and development contracts	9,142	6,965	6,452	6,452	0
25.7	Operation and maintenance of equipment	12,023	9,160	8,485	8,485	0
26	Supplies and materials	12,113	9,437	8,806	8,806	0
31	Equipment	11,954	11,954	11,954	11,954	0
32	Land and structures	0	0	0	0	0
41	Grants, subsidies, and contributions	3,526	2,686	2,488	2,488	0
42	Insurance claims and indemnities	0	0	0	0	0
43	Interest and dividends	17	0	0	0	0
99	Total Obligations	163,066	151,180	149,138	149,138	0

Personnel Data	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
Full-time equivalent employment:					
Full-time permanent	541	620	620	620	0
Other than full-time permanent	66	66	66	66	0
Total	607	686	686	686	0
Authorized Positions:					
Full-time permanent	620	620	620	620	0
Other than full-time permanent	66	66	66	66	0
Total	686	686	686	686	0

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

	FY 2019 Actual	FY 2020 Enacted	FY 2021 Estimate
Consulting Services			
Management and professional support services	$44	$19	$20
Studies, analyses, and evaluations	8	9	10
Engineering and technical services	1,379	858	857
Total	1,431	886	887

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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Exhibit 5

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, 2020	0	0	0	0	0
2021 Adjustments to Base	0	0	0	0	0
2021 Base/Estimate	0	0	0	0	0

Comparison by activity/subactivity with totals by activity		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/(Decrease) from 2021 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

Note: The budgetary resources for the NIST Public Safety Communications Research Fund will obligate over several fiscal years (through FY 2022).

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		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/(Decrease) from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
NIST Public Safety Communications Research Fund	Pos/Approp	78	0	80	0	80	0	80	0	0	0
	FTE/Obl.	82	$36,841	85	$66,105	80	$41,370	80	$41,370	0	0

Note: The budgetary resources for the NIST Public Safety Communications Research Fund will obligate over several fiscal years (through FY 2022).

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

	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
Total Obligations	$36,841	$66,105	$41,370	$41,370	0
Adjustments for:					
Recoveries	(235)	0	0	0	0
Refunds	(1)	0	0	0	0
Unobligated balance, start of year (Mandatory)	(195,107)	(158,502)	(92,397)	(92,397)	0
Unobligated balance from offsetting collections, end of year	158,502	92,397	51,027	51,027	0
Budget Authority/Appropriation - Mandatory Account	0	0	0	0	0

Note: The budgetary resources for the NIST Public Safety Communications Research Fund will obligate over several fiscal years (through FY 2022).

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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		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/Decrease from 2021 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

Note: The budgetary resources for the NIST Public Safety Communications Research Fund will obligate over several fiscal years (through FY 2022).

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		2019 Actual		2020 Enacted		2021 Base		2021 Estimate		Increase/(Decrease) from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
NIST Public Safety Communications	Pos/Approp	78	0	80	0	80	0	80	0	0	0
Research Fund	FTE/Obl.	82	$36,841	85	$66,105	80	$41,370	80	$41,370	0	0

Note: The budgetary resources for the NIST Public Safety Communications Research Fund will obligate over several fiscal years (through FY 2022).

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	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
11	Personnel compensation					
11.1	Full-time permanent	$8,763	$9,598	$9,041	$9,041	0
11.3	Other than full-time permanent	1,835	1,545	1,449	1,449	0
11.5	Other personnel compensation	125	125	125	125	0
11.9	**Total personnel compensation**	10,723	11,268	10,615	10,615	0
12.1	Civilian personnel benefits	3,413	3,583	3,376	3,376	0
13	Benefits for former personnel	2	0	0	0	0
21	Travel and transportation of persons	600	600	600	600	0
22	Transportation of things	73	73	50	50	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	627	1,056	800	800	0
24	Printing and reproduction	13	20	15	15	0
25.1	Advisory and assistance services	5,776	15,181	6,293	6,293	0
25.2	Other services from non-Federal sources	1,808	4,113	5,982	5,982	0
25.3	Other goods and services from Federal sources	1,429	4,152	1,645	1,645	0
25.5	Research and development contracts	2,203	1,504	1,000	1,000	0
25.7	Operation and maintenance of equipment	750	800	750	750	0
26	Supplies and materials	421	424	420	420	0
31	Equipment	605	2,182	793	793	0
32	Land and structures	0	0	0	0	0
41	Grants, subsidies, and contributions	8,397	21,149	9,031	9,031	0
43	Interest and dividends	1	0	0	0	0
99	Total Obligations	36,841	66,105	41,370	41,370	0

	Object Class	2019 Actual	2020 Enacted	2021 Base	2021 Estimate	Increase/Decrease from 2021 Base
99	Total Obligations	$36,841	$66,105	$41,370	$41,370	0
	Adjustments for:					
	Recoveries	(235)	0	0	0	0
	Refunds of prior year paid obligations	(1)				
	Unobligated balance from offsetting collections, start of year	(195,107)	(158,502)	(92,397)	(92,397)	0
	Unobligated balance from offsetting collections, end of year	158,502	92,397	51,027	51,027	0
	Appropriation	0	0	0	0	0
	Personnel Data					
	Full-time equivalent employment:					
	Full-time permanent:	63	69	65	65	0
	Other than full-time permanent	19	16	15	15	0
	Total	82	85	80	80	0
	Authorized Positions:					
	Full-time permanent	60	65	65	65	0
	Other than full-time permanent	18	15	15	15	0
	Total	78	80	80	80	0

Note: The NIST Public Safety Communications Research Fund will continue to obligate funds over several fiscal years (through FY 2022).

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; $92.7M was transferred to NIST in FY 2015, $7.3M was released from sequester in FY 2016, an additional $186.4M was transferred in FY 2016, and $13.6M was released from sequester in FY 2017. Currently, WIN has $158.5M in total resources with $66.1M anticipated for obligation in FY 2020, and $92.4M to be apportioned for subsequent years.

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 2019 Actual	FY 2020 Enacted	FY 2021 Estimate
Consulting Services			
Management and professional support services	$5,776	$15,181	$6,293
Studies, analyses, and evaluations	0	0	0
Engineering and technical services	0	0	0
Total	5,776	15,181	6,293

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.

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

(Obligations in thousands)

	FY 2019			FY 2020			FY 2021			
Source and Use of Funds Spent	Perm. Pos. [1/]	FTE	Oblig.	Perm. Pos. [1/]	FTE	Oblig.	Perm. Pos. [1/]	FTE	Oblig.	Approp. Requested
Direct Funding										
Scientific and technical research and services	2,557	2,377	$746,839	2,586	2,486	$773,980	2,188	2,088	$654,777	$652,027
Industrial technology services	99	85	158,967	99	96	167,362	18	16	25,252	25,252
Construction of research facilities	116	100	118,970	116	110	371,979	116	110	60,244	60,244
Total, direct funding	2,772	2,562	1,024,776	2,801	2,692	1,313,321	2,322	2,214	740,273	737,523
Reimbursable Funding and WCF Investments										
Construction of research facilities - building surcharge	0	0	1,122	0	0	778	0	0	0	
Research, development and supporting services:										
Federal government	415	367	94,382	415	415	94,701	415	415	92,227	
Calibrations and tests, technical and advisory services:										
Federal government	31	27	7,750	31	31	7,846	31	31	7,514	
Public and non-federal government	102	91	25,700	102	102	26,019	102	102	24,918	
Subtotal, Services	133	118	33,450	133	133	33,865	133	133	32,432	
National Voluntary Laboratory Accreditation Program	26	23	4,347	26	26	4,330	26	26	4,330	
Standard reference materials (SRMs):										
SRM Sales:										
Federal government	4	3	758	4	4	732	4	4	700	
Public and non-federal government	108	96	21,069	108	108	20,371	108	108	19,449	
Subtotal, SRM sales	112	99	21,827	112	112	21,103	112	112	20,149	
SRM investment adjustment	0	0	(269)	0	0	0	0	0	0	
Subtotal, SRM	112	99	21,558	112	112	21,103	112	112	20,149	
Total, Reimbursable program	686	607	154,859 [2/]	686	686	154,777 [2/]	686	686	149,138	
WCF Investments and Operating Adjustments										
WCF investments	0	0	23,518	0	0	23,109	0	0	23,109	
WCF operating adjustments	0	0	9,933	0	0	0	0	0	0	
Total, WCF Investments and operating adjustments	0	0	33,451	0	0	23,109	0	0	23,109	
Total, NIST program	3,458	3,169	1,213,086	3,487	3,378	1,491,207	3,008	2,900	912,520	
Offsetting adjustment for amortization of equipment	0	0	(24,122)	0	0	(25,928)	0	0	(23,109)	
Adjusted total, NIST program	3,458	3,169	1,188,964	3,487	3,378	1,465,279	3,008	2,900	889,411	

[1/] 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.

[2/] Total reimbursable numbers are different from the next page 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 2019 Actual	FY 2020 Enacted	FY 2021 Estimate
Department of Defense			
Air Force	$9,022	$9,000	$8,000
Army	92	1,411	860
Navy	2,052	1,689	1,010
Other, Department of Defense	17,788	17,454	15,596
Subtotal, Department of Defense	28,954	29,554	25,466
Department of Agriculture	0	120	120
Department of Commerce	20,054	21,457	21,978
Department of Energy	3,455	3,449	3,330
Dept. of Health & Human Services	4,750	4,465	3,904
Dept. of Homeland Security	13,408	12,584	11,924
Dept. of Housing & Urban Development	0	20	20
Department of the Interior	22	13	0
Department of Justice	5,329	5,346	7,713
Department of Transportation	1,213	797	594
Department of the Treasury	127	0	0
Department of Veterans Affairs	110	150	150
General Services Administration	238	28	9
National Aeronautics & Space Admin.	6,063	5,041	4,950
National Science Foundation	3,501	2,829	3,000
Nuclear Regulatory Commission	1,700	3,400	3,000
Other	5,458	5,448	6,069
Subtotal, Other Agency	94,382	94,701	92,227

	FY 2019 Actual	FY 2020 Enacted	FY 2021 Estimate
Calibrations & Testing	$7,296	$6,863	$6,875
Technical & Advisory Services	30,501	31,332	29,887
Standard Reference Materials	21,558	21,103	20,149
Subtotal, Other Reimbursables	59,355	59,298	56,911
Total, Reimbursable Program	153,737	153,999	149,138
Equipment Investments	23,518	23,109	23,109
IE Amortization	(24,122)	(25,928)	(23,109)
WCF Operating Adjustments	9,933	0	0
Total, WCF Investments	9,329	(2,819)	0
Total, Reimbursable Program and WCF Investments	163,066	151,180	149,138

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

	2019 Actual	2020 Enacted	2021 Estimate
Periodicals	0.0	0.0	0.0
Pamphlets	$10.0	$10.0	$10.0
Audiovisuals	70.0	75.0	85.0
Total	80.0	85.0	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

	2019 Actual	2020 Enacted	2021 Estimate
Average ES salary	$189,180	$195,045	$196,995
Average scientific and professional	189,798	195,682	197,639
Average career path salary	123,019	126,833	128,101
Average salary of ungraded positions	62,860	64,809	65,457

FY 2020 average salaries reflect a 3.1 percent pay raise and FY 2021 average salaries reflect a 1.0 percent pay raise.

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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 (SAR).

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

Report Number	Report Title	Issue Date	Recomm-endation Number	Recommendation	Action(s) Planned	Action Status (Planned, In-Progress, or Complete)	Target Completion Date	Recommendation Status (Planned, In-Progress, or Complete)
19-265	Scientific Integrity Policies: Additional Actions Could Strengthen Integrity of Federal Research	April 4, 2019	2	The Director of NIST should take action to educate and communicate the agency's scientific integrity policies to staff through, for example, regular training.	Scientific integrity is a core value at NIST, and NIST's greatest strength is its reputation for uncompromising rigor and technical excellence. During NIST's orientation for all new employees, NIST emphasizes that keeping scientific work independent of political interference is of the utmost importance and that doing so is, again, a core value of NIST. The importance of scientific integrity is conveyed to all employees, along with the NIST Directives system of which the scientific integrity directives are part (all directives are readily accessible on the NIST Intranet), during new employee orientation.	Complete. Closure request pending	n/a	Complete. Closure request pending.

Report Number	Report Title	Issue Date	Recomm-endation Number	Recommendation	Action(s) Planned	Action Status (Planned, In-Progress, or Complete)	Target Completion Date	Recommendation Status (Planned, In-Progress, or Complete)
					NIST has added an explicit reference to NIST Policy 5100.00, Scientific Integrity, to its new employee orientation training and has begun providing specific training regarding this directive during orientation. NIST will also make the training materials available to all employees on the NIST Intranet. NIST will also work with Commerce's National Oceanic and Atmospheric Administration (NOAA) to ensure that NIST employees will have access to pertinent NOAA online training as well.			
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.	NIST's Scientific Integrity Officer (SIO) and Office of the Chief Counsel (OCC) for NIST are each responsible for implementing portions of NIST Procedure 5101.01, Reporting and Resolving Allegations Regarding Violations of Scientific Integrity. The NIST Director has directed that, beginning with Fiscal Year 2019, the NIST SIO and OCC/NIST are to meet at least annually to review implementation of the NIST Scientific Integrity Policy and Order, and to evaluate and make recommendations to the NIST Director as to whether any improvements are needed.	Complete. Closure request pending	n/a	Complete. Closure request pending

Report Number	Report Title	Issue Date	Recomm-endation Number	Recommendation	Action(s) Planned	Action Status (Planned, In-Progress, or Complete)	Target Completion Date	Recommendation Status (Planned, In-Progress, or Complete)
19-288	Data Protection: Federal Agencies Need to Strengthen Online Identity Verification Processes	May 17, 2019	2	The Director of the National Institute of Standards and Technology should supplement the agency's 2017 technical guidance with additional guidance to assist federal agencies in determining and implementing alternatives to knowledge-based verification that are most suitable for their applications.	The National Institute of Standards and Technology will develop additional guidance to assist federal agencies with alternatives to knowledge-based verification.	In progress	June 2020	In progress
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.	Action plan is being developed.			

Report Number	Report Title	Issue Date	Recomm-endation Number	Recommendation	Action(s) Planned	Action Status (Planned, In-Progress, or Complete)	Target Completion Date	Recommendation Status (Planned, In-Progress, or Complete)
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.	Action plan is being developed.			

Report Number	Report Title	Issue Date	Recomm-endation Number	Recommendation	Action(s) Planned	Action Status (Planned, In-Progress, or Complete)	Target Completion Date	Recommendation Status (Planned, In-Progress, or Complete)
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.	Action plan is being developed.			

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	Recomm-endation 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	

Report Number	Report Title	Issue Date	Recomm-endation Number	Recommendation	Target Implementation Date	Closure Request Pending with GAO (Yes/No)	Clear Budget Implications (Yes/No)
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.	January 2020	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.	February 2020	No	
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	

Report Number	Report Title	Issue Date	Recomm-endation Number	Recommendation	Target Implementation Date	Closure Request Pending with GAO (Yes/No)	Clear Budget Implications (Yes/No)
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	2	The NIST Standards Coordination Office Director should update NIST policy for staff participation in standards development activities to provide additional guidance, such as the factors staff could consider when deciding to take more active roles, including leading efforts to develop standards.	December 2020	No	
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	4	The Director of NIST should establish a mechanism – such as guidelines for what constitutes adequate U.S. representation – to assess whether U.S. representation in international SDOs is adequate, and when to follow the statutory process for addressing inadequate U.S. representation. If NIST determines that it is unable to implement the process described in the 1979 act without conflicting with current standards policy, the Director of NIST should develop a legislative proposal to address those concerns.	April 2020	No	
18-656	Science and Technology: Considerations for Maintaining U.S. Competitiveness in Quantum Computing, Synthetic Biology, and Other Potentially Transformational Research Areas	Septe mber 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	

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

Include information on all OIG recommendations that are still officially open. Commerce OIG recommendations are open until closed by the Department OIG Liaison.

Report Number	None.
Report Title	
Issue Date	
Recommendation Number	
Recommendation	
Target Implementation	
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	
Recommendation	
Discrepancy	
Reason for Discrepancy	

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FY2021 ANNUAL PERFORMANCE PLAN / FY2019 REPORT (APPR) BACKUP

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

Building the Quantum Industry: Scientists at NIST have made continual breakthroughs this past year in the measurement and control of quantum systems. To enable the U.S. to fully capture the benefits of this transformational technology NIST is establishing the Quantum Economic Development Consortium (QEDC) in partnership with SRI International. The Consortia consists of over 50 interested industry members ranging from large corporations like IBM and AT&T to the companies developing the emerging technology applications like Rigetti and IonQ. The QEDC will support precompetitive R&D such as quantum device design and prototyping; coordinate public and private investments; determine workforce needs; build out the research infrastructure needed to grow this industry.

Artificial Intelligence Standards Development: On August 10, 2019 NIST released a plan for prioritizing Federal agency engagement in the development of standards for artificial intelligence (AI). The plan, a requirement of a February 2019 Executive Order on Maintaining American Leadership in Artificial Intelligence, provides a foundation for the Federal Government to effectively engage in standards development activities for technologies and systems utilizing AI in order to promote the reliability and trustworthiness of those systems for the benefit of the American people. The plan recommends the Federal Government bolster AI standards-related knowledge, provide leadership and coordination among agencies that develop or use AI; promote focused research on the trustworthiness of AI systems; support and expand public-private partnerships; and engage with international parties. NIST developed the plan with extensive public and private sector involvement, including a May 30, 2019 workshop and multiple opportunities for public comment. NIST received comments from more than 40 organizations in industry, academia and government on a draft plan released July 2, 2019.

Quantum Based Measurements: The NIST-on-a-Chip (NoaC) program is aimed at creating prototypes for small, inexpensive, low-power and easily manufactured quantum-based sensors. In the past year, NIST developed a NoaC technology roadmap and instituted a pilot program for more efficient transfer of NoaC concepts to industry. The targeted effort has yielded several agreements with companies regarding technologies in the portfolio that leverage NIST's deep technical expertise in quantum science. For example, NIST recently announced it has submitted a patent application for its next-generation atomic clock that is smaller than a coffee bean and designed with manufacturability in mind. NIST, in a joint effort with industry, is developing a new chip-scale thermometer that uses the optical properties of materials to measure changes in temperature.

SO 3.2

Cybersecurity and Privacy: Over the past year, the newest version (1.1) of NIST's Framework for Improving Critical Infrastructure Cybersecurity, more widely known as the Cybersecurity Framework, has continued to be adopted voluntarily by large and small companies and organizations across all industry sectors, as well as by Federal, state and local governments. The Cybersecurity Framework has been translated into Spanish, Portuguese, Arabic, Japanese, Hebrew, and Italian, and has been adopted by companies and governments around the world. Helping to put good cybersecurity into practice, the National Cybersecurity Center of Excellence (NCCoE) has released 26 guides and established 220 industry collaborators (as of April), and the Center's publications have been downloaded over 312,000 times. NIST is currently developing a Privacy Framework, complementary to the Cybersecurity Framework, to help organizations better address the full scope of privacy risk with more tools to support better implementation of privacy protections (draft to be released Q4 of FY 2019).

Post-Quantum Cryptography: NIST has issued a race to spur the cryptography community to develop effective defenses to the threat of quantum computers, which could one day render many of our encryption models obsolete. After more than a year of evaluation, NIST recently announced the 26 entries that will be moving on to the second round of the NIST Post-Quantum Cryptography Standardization Process. The top 26 algorithms were deemed the most promising in terms of their ability to protect electronic information from attack by the computers of both tomorrow and today. The second phase of evaluation and review will last 12-18 months, during which time, NIST will conduct outreach to the community at workshops and manage the technical review of how the algorithms work across a variety of systems.

Planned Actions for FY 2021

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:
The major external factor that will impact NIST's progress on SOs is proposed 30% reduction in funding from currently enacted funding levels. This reduction represents a 15% cut in funding available to support measurement science and standards research, and a 16% reduction in NIST's scientific and engineering workforce. Despite reprioritizing work to support key national priorities in quantum science, AI, and microelectronics the proposed reductions will decrease NIST's scientific productivity.

A major internal factor that will impact NIST's progress on SOs is $500 million backlog in deferred maintenance of NIST's infrastructure. Currently 57% of NIST Gaithersburg Facilities are in poor or critical condition per DOC standards.

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 (SI) 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;
- support the Manufacturing USA Program by overseeing the planning, management, coordination and congressional reporting of the Program; and
- focus NCCoE 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. Assessments are performed 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.

Trends in performance indicators within SO 1.2:
Overall NIST exceeded performance targets for FY2019. These measures look at the relevance of NIST scientific work through both impact factors and the willingness of industry to partner or co-invest with NIST. For example, through the NoaC program significant strides have been made in applying quantum science breakthroughs to advanced metrology. A total of 4 CRADAs have been executed and 3 more are under discussion. The portfolio contains a total of 11 issued patents, 10 invention disclosures, and 15 applications in process.

In the area of SI, NIST and colleagues in other metrology institutes played critical role in redefining SI units using fundamental constants of nature and quantum-enabled realizations. The impact of this redefinition is improved scalability for measurement, more effective control of processes, and ultimately improved innovation.

In the area of spectrum sharing, NIST has played a major role in the development of standards, test procedures and certification tools that will allow service providers and other potential users to prove that they can operate in the 3.5 GHz Band under Federal Communication Commission regulations and assure the Navy that the band can be successfully shared without interference.

The reduced funding levels proposed for FY2020 and FY2021 will have significant impacts on NIST's scientific research capabilities and area expected to reduce the overall level of scientific output, which is reflected in the targets for FY 2020 and FY 2021.

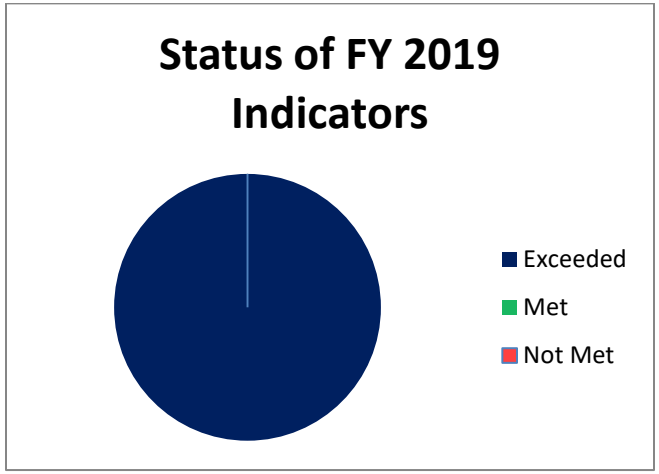
Trends in performance indicators within SO 3.2:
NIST exceeded performance expectations in the areas of cybersecurity. NIST continued to enhance the Nation's cybersecurity through its progress in the priority areas of Privacy, Small Business Cybersecurity, Cybersecurity for Internet of Things (IoT), accelerating the adoption of practical, standards-based cybersecurity and reducing the threat of BotNets through collaboration with Industry. NIST continued to increase the adoption of practical, standards-based cybersecurity approaches through the NCCoE.

NIST initiated an open and collaborative approach to develop a voluntary Privacy Framework; Small Business Cybersecurity Corner was launched in response to the NIST Small Business Cybersecurity Act (August 2018); NIST released seminal report on the status of international cybersecurity standardization for the IoT (NIST Interagency Report 8200); NIST announced the second round of quantum resistant algorithms; finally, NIST updated the Federal Information Processing Standards 140, Security Requirements for Cryptographic Modules, as called for in the American Technology Council Modernization report.

NIST is not planning any budget reductions to ongoing work in the area of cybersecurity and privacy and as a result do not see any expected impacts to the targets for FY 2020 and FY 2021.

SUMMARY OF PERFORMANCE INDICATORS

This pie chart and summary table should only include "reported" indicators (see Terms and Definitions below). Use the colors shown below to point out metrics that were Exceeded (over 100% of target); Met (90%-100% of target); Not Met (below 90% of target). The chart and table are embedded excel files. Status in the table is pre-calculated. Once actuals and targets are entered, the status cell will populate automatically.



Strategic Objective	Indicator	FY 2019 Target	FY 2019 Actual	Status
1.2	International adoption of NIST Quantum SI Standards	4	5	Exceeded
1.2	Relative citation impact of NIST-authored publications	1.30	1.69	Exceeded
1.2	Number of businesses using NIST research facilities	300	486	Exceeded
1.2	Dollar amount of co-investment by non-federal sources in DOC-supported Manufacturing USA Institutes	$20,000,000	$30,000,000	Exceeded
3.2	Number of companies and organizations exposed to NCCoE-produced Cybersecurity practise guides and other products	6,000	8,995	Exceeded
3.2	Number of resources, derived from the Cybersecurity Framework	80	133	Exceeded
3.2	Cumulative number of collaborators on NCCoE projects	140	190	Exceeded

ALL PERFORMANCE INDICATORS

Indicator	International adoption of NIST Quantum SI Standards						
Strategic Goal	Goal 1: Accelerate American Leadership						
Objective	1.2 Advance Innovation						
Program Activity Name	LABORATORY PROGRAMS						
Indicator Class	New						
Type	Outcome						
Source	Indicator shows cumulative count of devices commercialized, in process of commercialization through CRADAs or patent licenses, and embedded in national and international laboratories.						
Description	In May 2019, the SI will be redefined with units based on fundamental constants of nature. NIST's role in this transition from a classical to a quantum definition will be one of leadership. NIST will explore the foundational limits of the Quantum SI by integrating efforts in fundamental research, applied research and dissemination of the SI units. NIST's goal is to develop Quantum SI standards and sensors for mainstream US industry, and disruptively change the classical dissemination modality.						
	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Target				3	4	5	6
Actual				3	5		
Status*	n/a	n/a	n/a	Met	Exceeded		

*Status is defined as follows: Exceeded (over 100% of target); Met (90%-100% of target); Not Met (below 90% of target). Once actuals and targets are entered, the status cell should populate automatically.

Indicator	Relative citation impact of NIST-authored publications						
Strategic Goal	Goal 1: Accelerate American Leadership						
Objective	1.2 Advance Innovation						
Program Activity Name	LABORATORY PROGRAMS						
Indicator Class	Current/Recurring						
Type	Outcome						
Source	https://incites.thomsonreuters.com/#/signin						
Description	This indicator demonstrates that NIST consistently produces useful and relevant scientific and technical publications and is outcome-oriented. The "relative citation impact" indicator is the ratio of the average number of citations per publication (citation rate) for all NIST publications in a year to the average expected citation rate for similar publications in a large group of peer institutions in the world.						
	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Target	1.50	1.50	1.60	1.60	1.30	1.30	1.30
Actual	1.70	1.80	1.66	1.62	1.69		
Status*	Exceeded	Exceeded	Exceeded	Exceeded	Exceeded		

*Status is defined as follows: Exceeded (over 100% of target); Met (90%-100% of target); Not Met (below 90% of target). Once actuals and targets are entered, the status cell should populate automatically.

Indicator	Number of businesses using NIST research facilities						
Strategic Goal	Goal 1: Accelerate American Leadership						
Objective	1.2 Advance Innovation						
Program Activity Name	LABORATORY PROGRAMS						
Indicator Class	Current/Recurring						
Type	Outcome						
Source	Sum of companies using CNST, NCNR, and unique companies with CRADAs						
Description	This indicator reflects the value, relevance, and usefulness of NIST research facilities to industry users. NIST research facilities are unique capabilities that can be leveraged through partnerships with businesses, especially manufacturers, to accelerate discovery and commercialization of innovative products. This indicator counts the number of Cooperative Research and Development Agreements between industry and NIST laboratories, as well as the number of industrial institutions that use the NIST user facilities (NIST Center for Neutron Research and the Center for Nanoscale Science and Technology).						
	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Target	225	275	325	325	300	300	300
Actual	444	435	442	450	491		
Status*	Exceeded	Exceeded	Exceeded	Exceeded	Exceeded		

*Status is defined as follows: Exceeded (over 100% of target); Met (90%-100% of target); Not Met (below 90% of target). Once actuals and targets are entered, the status cell should populate automatically.

Indicator	Dollar amount of co-investment by non-federal sources in DOC-supported Manufacturing USA Institutes						
Strategic Goal	Goal 1: Accelerate American Leadership						
Objective	1.2 Advance Innovation						
Program Activity Name	MANUFACTURING USA						
Indicator Class	Current/Recurring						
Type	Outcome						
Source	The Office of Advanced Manufacturing collects financial information from federal agency partners.						
Description	This indicator reflects how well the focus area of the Manufacturing USA Institutes matches a real national need and is intended to measure the extent to which the industrial partners perceive that they are receiving value from the existence of the Institute. Non-federal partners dedicate resources when they believe that there will be economic benefit. Non-federal sources include industry partners of all sizes, state and local governments, economic development entities, institutions of higher education, private organizations and individuals. Investment includes cash and in-kind resources provided.						
	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Target* ($M)			$6.0	$15.0	$20.0**	$42.5	$40.5
Actual*			$8.9	$28.2	$30.0		
Status***	n/a	n/a	Exceeded	Exceeded	Exceeded		

*Dollar amounts are listed in millions

**In Q3 of FY 2019 Manufacturing USA Institute NIMBLE (National Institute for Innovation in Manufacturing Biopharmaceuticals) adjusted the budget based on the actual federal expenditure, which led to a decrease in projected non-federal co-investment from $29.0M to $20.0M.

***Status is defined as follows: Exceeded (over 100% of target); Met (90%-100% of target); Not Met (below 90% of target). Once actuals and targets are entered, the status cell should populate automatically.

Indicator	Number of companies and organizations exposed to NCCoE-produced Cybersecurity practice guides and other products						
Strategic Goal	Goal 3: Strengthen U.S. Economic and National Security						
Objective	3.2 – Enhance the Nation's Cybersecurity						
Program Activity Name	LABORATORY PROGRAMS						
Indicator Class	New						
Type	Outcome						
Source	Webpage views and document downloads from nccoe.nist.gov						
Description	The NCCOE is a critical component of NIST's efforts to strengthen the Nation's cybersecurity. It is a collaborative hub where industry organizations, government agencies, and academic institutions work together to address businesses' most pressing cybersecurity challenges. This public-private partnership enables the creation of practical cybersecurity solutions for specific industries or broad, cross-sector technology challenges. This indicator will provide insight into NIST's success in providing relevant products for the Nation.						
	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Target				5,500	6,000	10,000	11,500
Actual				7,710	8,995		
Status*	n/a	n/a	n/a	Exceeded	Exceeded		

*Status is defined as follows: Exceeded (over 100% of target); Met (90%-100% of target); Not Met (below 90% of target). Once actuals and targets are entered, the status cell should populate automatically.

Indicator	Number of resources derived from the Cybersecurity Framework						
Strategic Goal	Goal 3: Strengthen U.S. Economic and National Security						
Objective	3.2 – Enhance the Nation's Cybersecurity						
Program Activity Name	LABORATORY PROGRAMS						
Indicator Class	New						
Type	Outcome						
Source	Professional engagements with organizations, including industry, academia, government, and non-government organizations						
Description	This indicator seeks to demonstrate that use of the Cybersecurity Framework is increasing, and that guidance and other tools are being developed and made publicly available to help organizations use the Framework to understand, manage, and communicate cybersecurity risk. Cybersecurity Framework resources may be developed by any organization, including industry, academia, government, and non-government organizations. These resources may include, but are not limited to, implementation guides, mappings, case studies, educational materials, example profiles, etc.						
	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Target				70	80	150	175
Actual				94	133		
Status*	n/a	n/a	n/a	Exceeded	Exceeded		

*Status is defined as follows: Exceeded (over 100% of target); Met (90%-100% of target); Not Met (below 90% of target). Once actuals and targets are entered, the status cell should populate automatically.

Objective	3.2 – Enhance the Nation's Cybersecurity						
Program Activity Name	LABORATORY PROGRAMS						
Indicator Class	New						
Type	Outcome						
Source	Sum of companies/organizations that participate with NCCoE as NCEPs, CRADA collaborators, academic affiliates and interagency agreements						
Description	This indicator demonstrates that NCCoE work products are available to industry. Companies that participate in NCCoE projects partner with NIST through Technology Partnerships, Cooperative Research and Development Agreements, and Interagency Agreements. These partnerships are in-depth, active collaborations. The outputs of these projects become publicly available to the whole community in work products like NIST Special Publications, fact sheets, and demos.						
	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Target				123	140	205	215
Actual				176	190		
Status*	n/a	n/a	n/a	Exceeded	Exceeded		

*Status is defined as follows: Exceeded (over 100% of target); Met (90%-100% of target); Not Met (below 90% of target). Once actuals and targets are entered, the status cell should populate automatically.

DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
NTIS Revolving Fund
Budget Estimates, Fiscal Year 2021
Congressional Submission

Table of Contents

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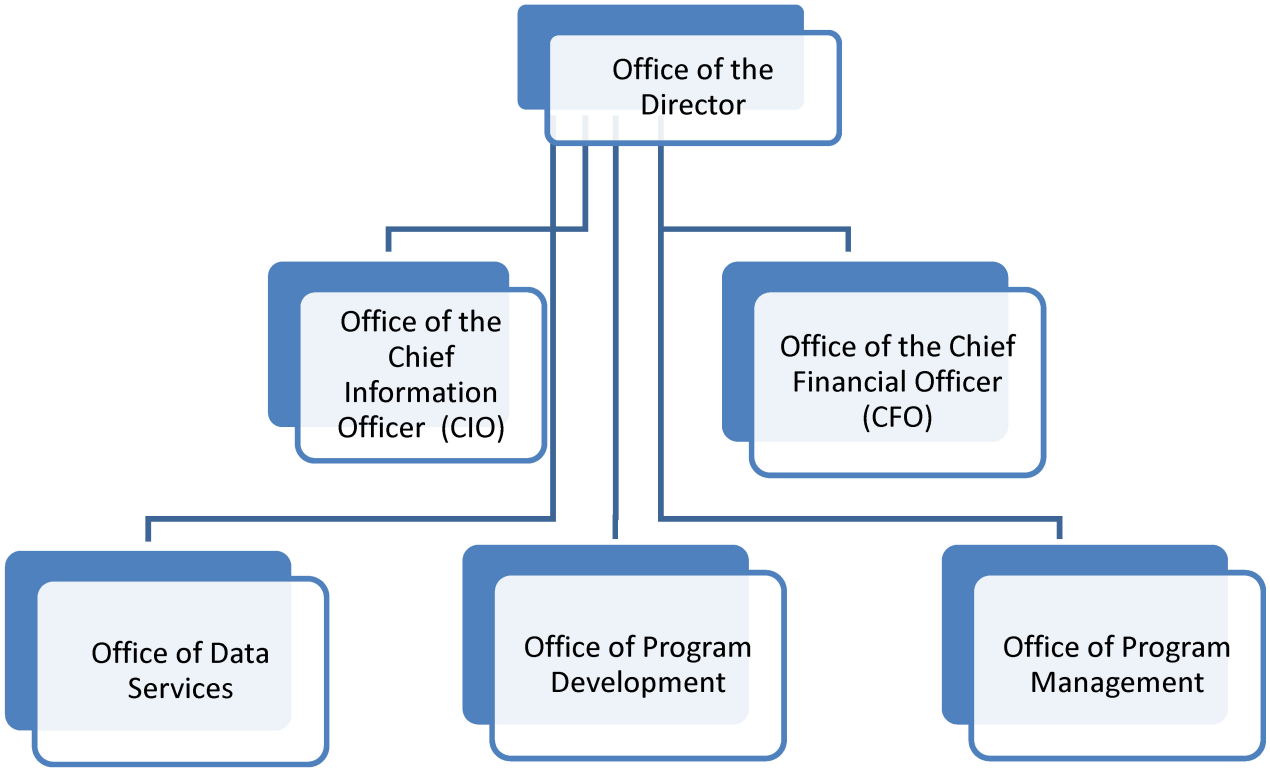
Exhibit 2

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 2021

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.

Exhibit 5

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, 2020	0	0	0	0
Plus 2021 Adjustments to Base	0	0	0	0
Less: Obligations from prior years	0	0	0	0
2020 Base Request	0	0	0	0
Plus 2021 program changes	0	0	0	0
2021 Estimate	0	0	0	0

		2019 Actual		2020 Estimate		2021 Base		2021 Estimate		Increase/(Decrease over 2021 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		2019 Actual		2020 Estimate		2021 Base		2021 Estimate		Increase/Decrease from 2021 Base	
		Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount	Personnel	Amount
National Technical Information Service:	Pos./BA	75	0	42	0	60	0	60	0	0	0
Information Clearinghouse Program	FTE/Obl.	61	$78,427	42	$110,000	60	$100,000	60	$100,000	0	0
Total	Pos./BA	75	0	42	0	60	0	60	0	0	0
	FTE/Obl.	61	78,427	42	110,000	60	100,000	60	100,000	0	0

Exhibit 7

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

	2019 Actual	2020 Estimate	2021 Base	2021 Estimate	Increase/ Decrease/ over 2021 Base
Total Obligations	78,427	110,000	100,000	100,000	0
Offsetting collections from:					
Federal funds	(74,637)	(105,000)	(95,000)	(95,000)	0
Trust funds	0	0	0	0	0
Non-Federal sources	(5,608)	(5,000)	(5,000)	(5,000)	0
Recoveries	0	0	0	0	0
Unobligated balance, start of year	(12,031)	(26,218)	(26,218)	(26,218)	0
Unobligated balance transferred	0	0	0	0	0
Unobligated balance, end of year	26,218	26,218	26,218	26,218	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 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 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 (NTRL) 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; Social Security Administration (SSA) Limited Access Death Master File (DMF); and, Drug Enforcement Agency (DEA) Drug Registry File.

Line Item		2019 Actual		2020 Estimate		2021 Estimate	
		Personnel	Amount	Personnel	Amount	Personnel	Amount
NTIS Revolving Fund	Pos./BA	75		42		60	
	FTE/Obl	61	78,427	42	110,000	60	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	2019 Actual	2020 Estimate	2021 Base	2021 Estimate	Increase/ (Decrease) over 2021 Base
11.1	Full-time permanent compensation	$ 7,106	$ 5,700	$ 6,350	$ 6,350	0
11.3	Other than full-time permanent	110	110	125	$ 125	0
11.5	Other personnel compensation	126	106	125	$ 125	0
11.8	Special personnel services payments	0	0	0	0	0
11.9	**Total personnel compensation**	7,342	5,916	6,600	6,600	0
12.1	Civilian personnel benefits	2,387	1,686	1,850	$ 1,850	0
13	Benefits for former personnel	0	598	0	0	0
21	Travel and transportation of persons	0	75	75	$ 75	0
22	Transportation of things	226	250	250	$ 250	0
23	Rent, communications, and utilities	0	0	0	$ -	0
23.1	Rental payments to GSA	1,071	2,000	2,000	$ 2,000	0
23.2	Rental payments to others	750	50	50	$ 50	0
23.3	Communications, utilities, and misc. charges	750	1,800	1,800	$ 1,800	0
24	Printing and reproduction	0	4	4	$ 4	0
25	Other contractual services	0	0	0	$ -	0
25.1	Advisory and assistance services	0	100	100	$ 100	0
25.2	Other services from non-Federal sources	63,064	90,771	81,521	$ 81,521	0
25.3	Other goods and services from Federal sources	1,366	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	975	500	500	$ 500	0
26	Supplies and materials	193	500	500	$ 500	0
31	Equipment	303	2,000	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	2019 Actual	2020 Estimate	2021 Base	2021 Estimate	Increase/ (Decrease) over 2021 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	78,427	110,000	100,000	100,000	0
	Earned Revenue/Reimbursable Obligations	78,427	110,000	100,000	100,000	0
	Total Obligations	78,427	110,000	100,000	100,000	0
	Personnel Data					
	Full-Time Equivalent Employment:					
	Full-time permanent	61	41	55	55	0
	Other than full-time permanent	0	1	5	5	0
	Total	61	42	60	60	0
	Authorized Positions:					
	Full-time permanent	70	41	55	55	0
	Other than full-time permanent	5	1	5	5	0
	Total	75	42	60	60	0

Exhibit 34

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

	2019 Actual	2020 Estimate	2021 Estimate
Consulting Services	$ -	$ -	$ -
Management and professional services	$ -	$ 100	$ 100
Special studies and analysis	$ -	$ -	$ -
Management & Support Services for research and development	$ -	$ -	$ -
Total	$ -	$ 100	$ 100

Exhibit 35

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

	2019 Actual	2020 Estimate	2021 Estimate
Periodicals	$ -	$ -	$ -
Pamphlets	$ -	$ -	$ -
Audiovisuals	$ -	$ -	$ -
Total	$ -	$ -	$ -

Exhibit 36

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

	2019 Actual	2020 Estimate	2021 Estimate
Average GS/GM Grade	13	12	12
Average GS/GM Salary	$116,938	$113,132	$123,116

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

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.

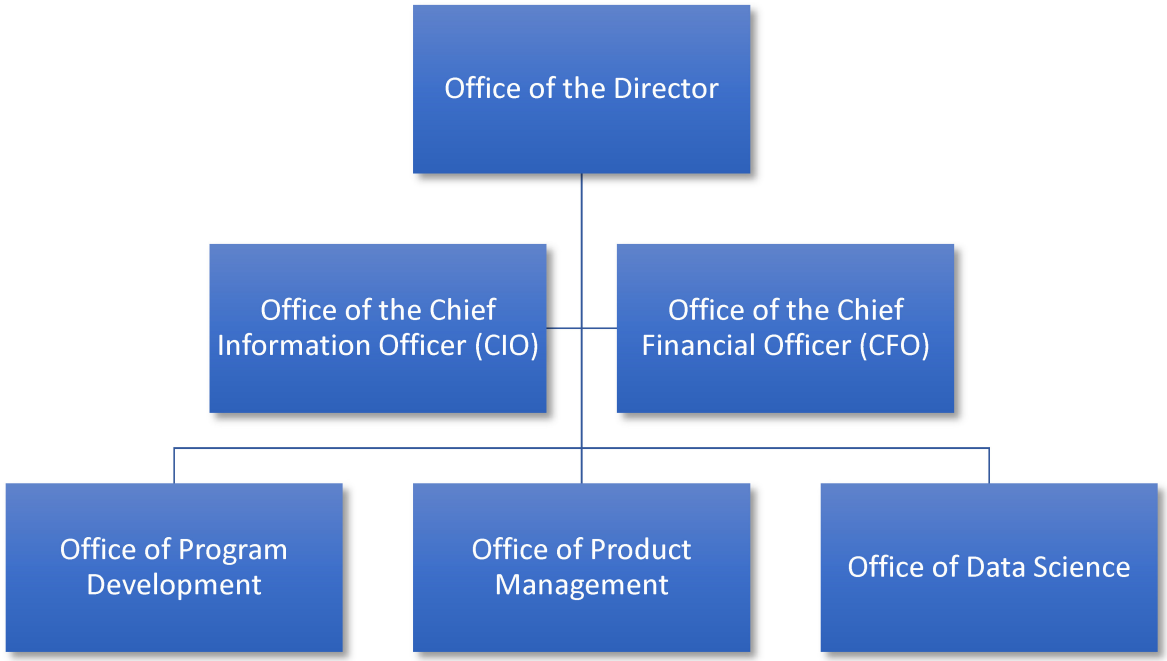
ii) Mission statement

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		
Status					Exceeded	Exceeded		
Trend								
Action(s) to achieve FY 2021 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		
Status					Not Met	Not Met		
Trend	Increasing towards meeting targets.							
Action(s) to achieve FY 2021 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		
Status					Exceeded	Exceeded		
Trend	Increasing							
Action(s) to achieve FY 2021 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							