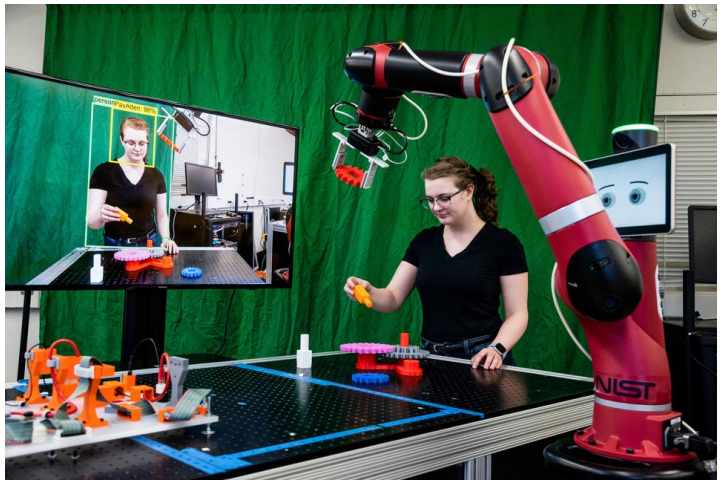
National Institute of Standards and Technology
U.S. Department of Commerce

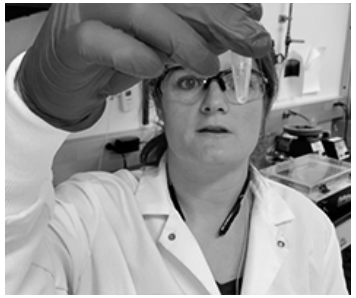
NIST FY 2022 President's Budget Request

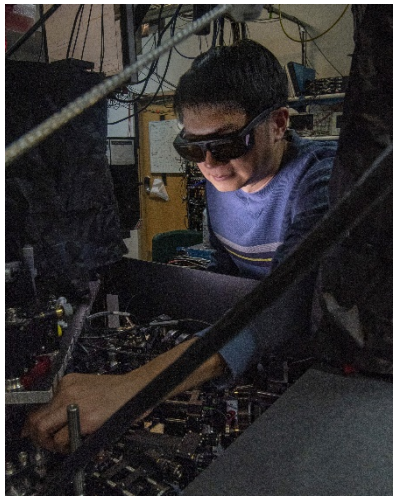
NIST: Aligned with the Administration's Priorities



Manufacturing USA®

MEP National Network™





BALDRIGE Performance Excellence Program

NIST role includes:

- Supporting national manufacturing networks, workforce development
- Driving discovery in emerging technologies - AI, quantum science, synthetic biology, and more
- Securing the supply chain through new research, measurements, standards and other tools
- Highest credibility source for science-based standards and tools for climate measurements, resilience, and clean energy

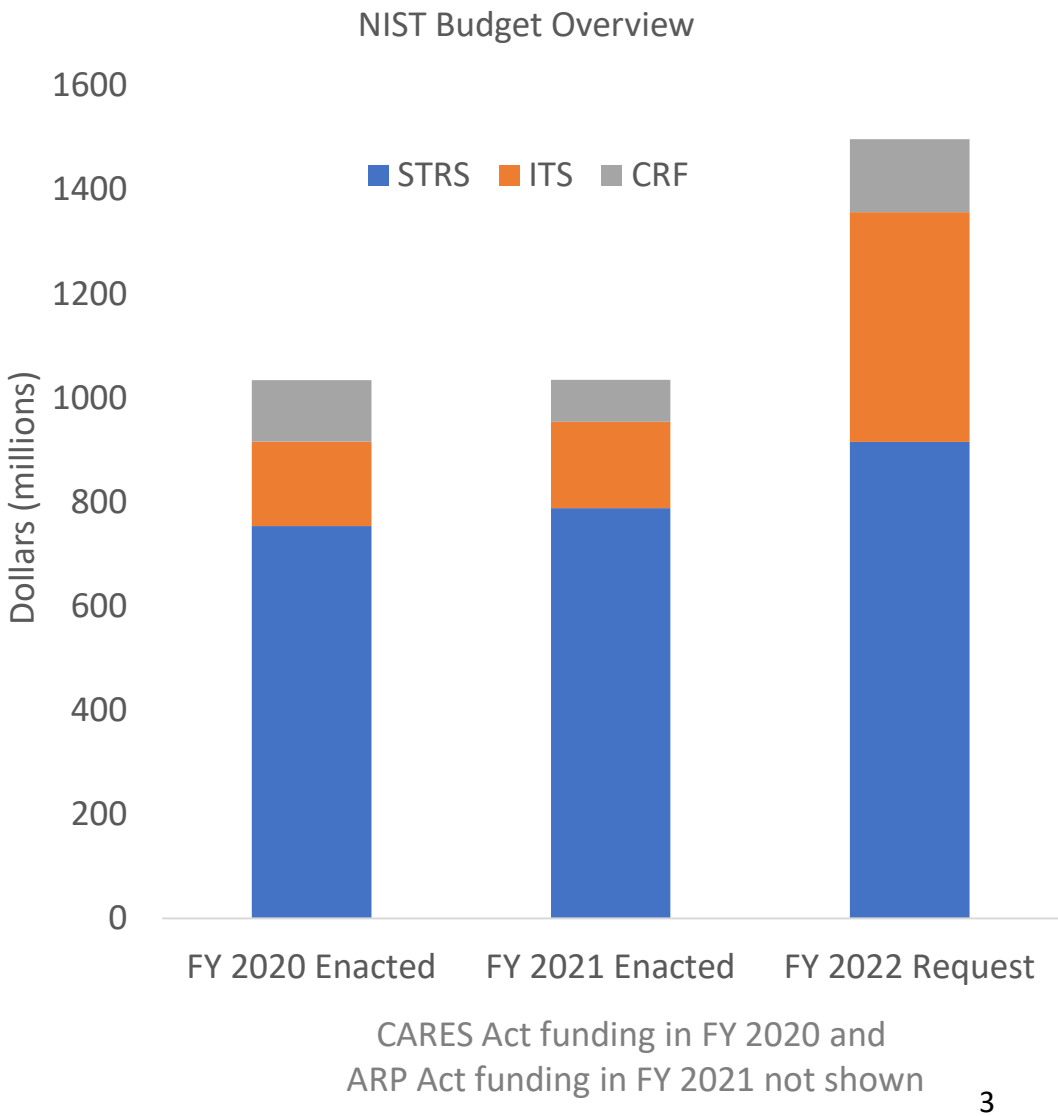
NIST 2022 Budget Summary

The FY 2022 budget request is an increase of **$462.8 M** over FY 2021 enacted levels to fully fund inflationary adjustments to current programs, grow funding for nationally critical mission areas, and expand NIST's manufacturing programs.

- A **44.7% increase** from current funding

This increase positions NIST to address critical national priorities:

- Advanced Communications/5G
- Advanced Manufacturing & Semiconductors
- Artificial Intelligence
- Biotechnology
- Climate, Environment, & Energy
- Cybersecurity and Privacy
- Internet of Things
- Quantum Science
- Racial Equity
- Standards Leadership



Budget Summary

	FY 2020 Enacted	FY 2020** CARES Act P.L. 116-136	FY 2021 Enacted	FY 2021** ARP Act P.L. 117-2	FY 2022 President's Request	+/- over FY 2021 Enacted
STRS	**$754.0**	**$6.0**	**$788.0**	**$0.0**	**$915.6**	**$127.6**
Laboratory Programs	655.8	6.0	687.1	0.0	806.0	118.9
Corporate Services	17.3	0.0	17.5	0.0	18.1	0.6
Stds Coord & Special Pgms *	80.9	0.0	83.4	0.0	91.5	8.1
ITS	**$162.0**	**$60.0**	**$166.5**	**$150.0**	**$441.7**	**$275.2**
Hollings Mfg Ext Partnership	146.0	50.0	150.0	0.0	275.0	125.0
Manufacturing USA	16.0	10.0	16.5	150.0	166.7	150.2
CRF	**$118.0**	**$0.0**	**$80.0**	**$0.0**	**$140.0**	**$60.0**
Construc & Major Renovations	43.0	0.0	6.1	0.0	0.0	(6.1)
Saf, Cap, Maint & Maj Repairs	75.0	0.0	73.9	0.0	140.0	66.1
Total, NIST Discretionary	**1,034.0**	**66.0**	**1,034.5**	**150.0**	**1,497.3**	**462.8**

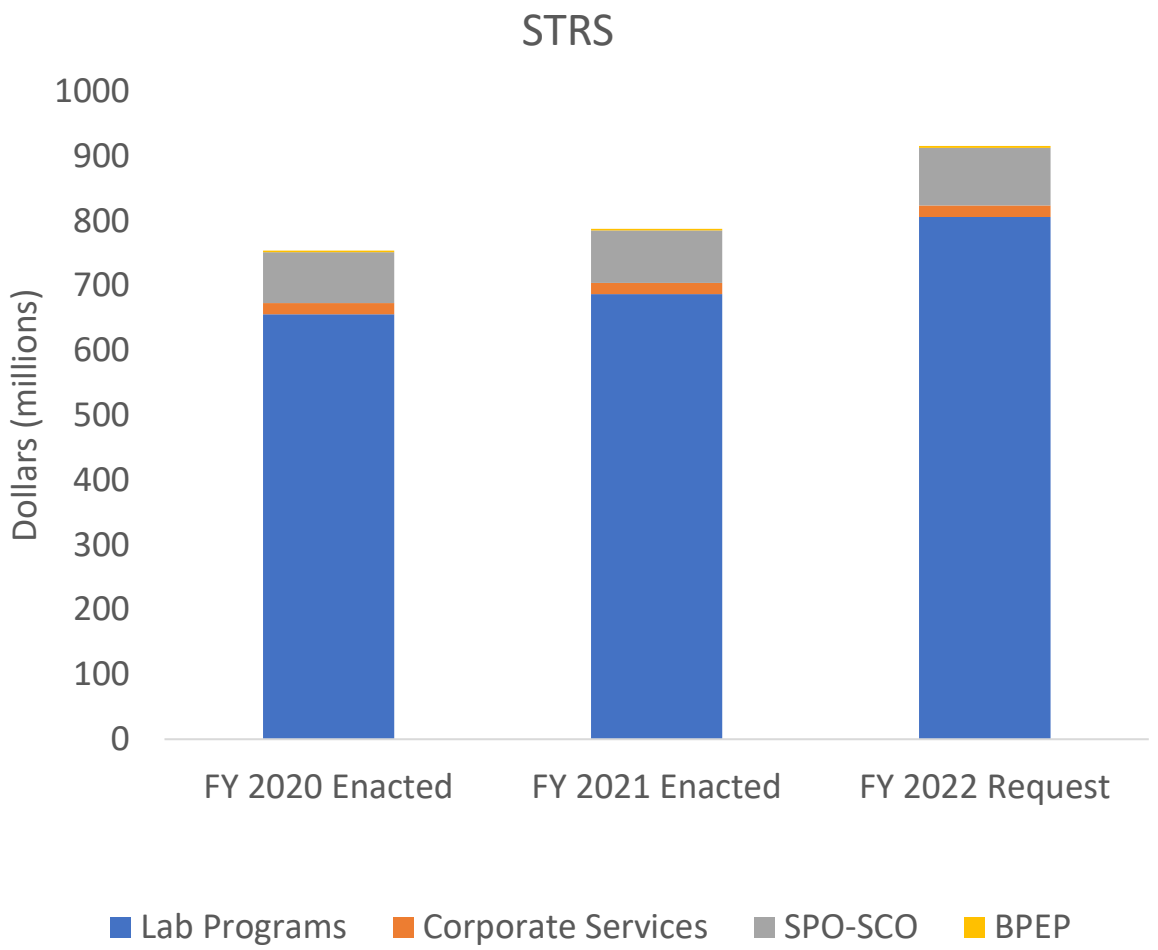
* Includes Baldrige Performance Excellence Program funding fro $2.2M in FY 2020, $2.5M in FY 2021, and $2.6M in FY 2022.

** Supplemental funding of CARES Act and ARP Act are presented but not included in the increase/decrease comparison column.

STRS: $915.6 M (+$127.6 M and 164 Positions)

NIST is prioritizing efforts in core mission research and key national and Administration priorities

- An **increase of 16.2% from FY 2021** levels for NIST research programs
- 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



CARES Act funding in FY 2020 and ARP Act funding in FY 2021 not shown

New Efforts to Ensure U.S. Leadership in Key Areas

Climate & Energy +$20 M

Resources to predict, measure, and manage the changing climate, and innovations for resilient energy infrastructure and intelligent buildings

Quantum Science +$15 M

New quantum networking grand challenge will build on NIST world-leading science, while NIST expands the Quantum Economic Development Consortium

Artificial Intelligence +$15 M

Leading efforts to prioritize and address key AI issues while developing training and testing tools for research domains

Bioeconomy +$14 M

Living Systems Foundry for safe, predictable design and control of biological systems

Advanced Communications +$12 M

Measurements to support wide deployment of 5G wireless and public safety leadership and engagement in standards development

Microelectronics +$10 M

Measurements and research to support semiconductor and microelectronics innovations

Circular Economy +$5 M

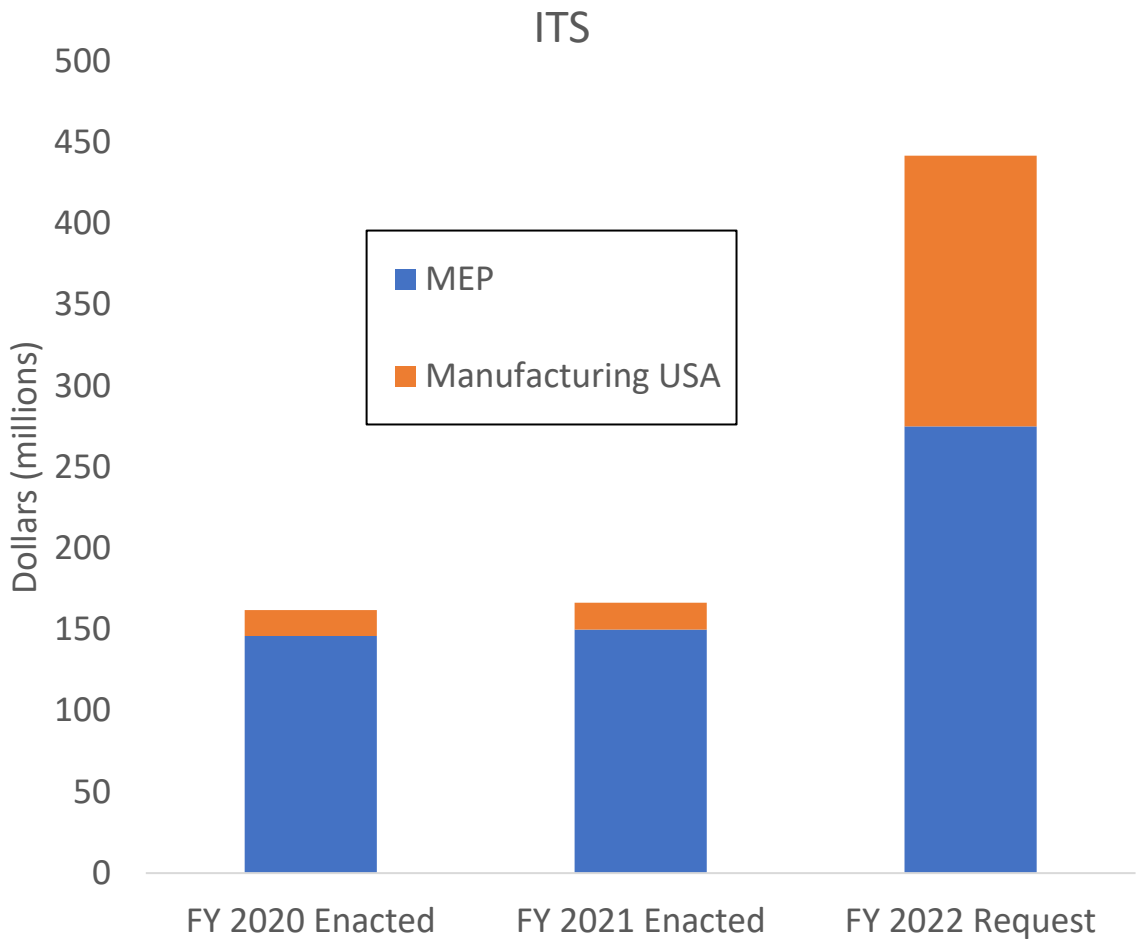
Measurements and research to efficiently recover plastics and other materials in the supply chain

Equity and Diversity in the Workforce +$5.1 M

Developing pipelines for the next generation of measurement scientists

ITS: $441.65 M (+$275.1 M and 63 Positions)

- The FY 2022 President's Budget grows and strengthens the Manufacturing USA Program
  - Continues support for program coordination and network support and fully funds NIIMBL
  - Provides funding for 2 new institute
- The FY 2022 Request nearly Doubles MEP funding
  - Strengthens a network of 51 institutes in every state and Puerto Rico
  - Enables new investments to strengthen supply chains, support workforce training and promote technology adoption



CARES Act funding in FY 2020 and
ARP Act funding in FY 2021 not shown

Increase Core Funding to MEP Centers

With a 30-year track record of serving small and medium-sized manufacturers, MEP is uniquely positioned to implement the measures necessary to unlock the economic potential of manufacturing.

Image Credit: Pixabay

Challenges:

- MEP Centers lack resources to serve all the needs of manufacturers in their region
- Proposed infrastructure investments demand even greater U.S. manufacturing to secure products made by American manufacturers

MEP funding increase will:

- Provide direct support that enables U.S. manufacturers to:
  - adopt new technologies
  - fortify cybersecurity
  - improve processes
  - expand training
  - respond to external shocks
- Reach more manufactures regardless of geographic location
- Leverage more manufacturing stakeholders across government, industry, and academia

Impacts:

MEP Centers will provide more services to at least 25% more manufacturers.

More materials and products will be made in America by American manufacturers.

The American manufacturing economy will be stronger and more resilient.

New MEP Initiatives

MEP National Supply Chain Initiative will identify and map critical supply chains, expand MEP Supplier Scouting, and increase individual manufacture resiliency.


Image Credit: Pixabay

MEP National Workforce Development Initiative Enhance MEP's ability to help manufactures attract a new workforce, create innovative on-ramps, and work with community leaders to overcome economic barriers.


Image Credit: iStock/gorodenkoff

MEP Manufacturing Technology Demonstration Facilities will be established in critical technology and supply chain areas to expose to and train small-to-medium sized manufacturers (SMMs) on advanced technology and expand the MEP Assisted Technology and Technical Resource (MATTR) service.

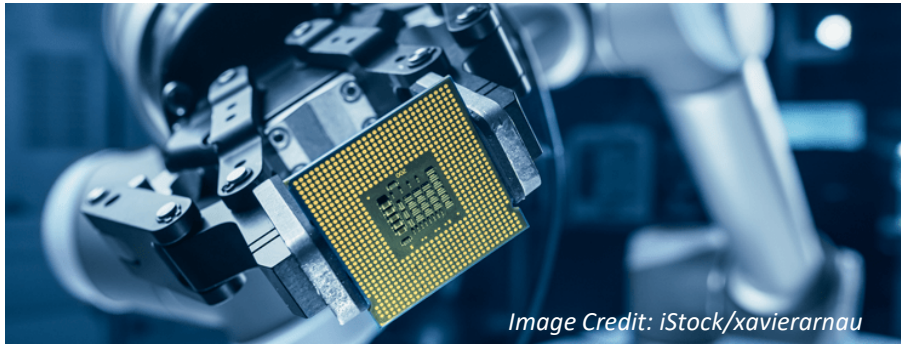


Image Credit: iStock/xavierarnau

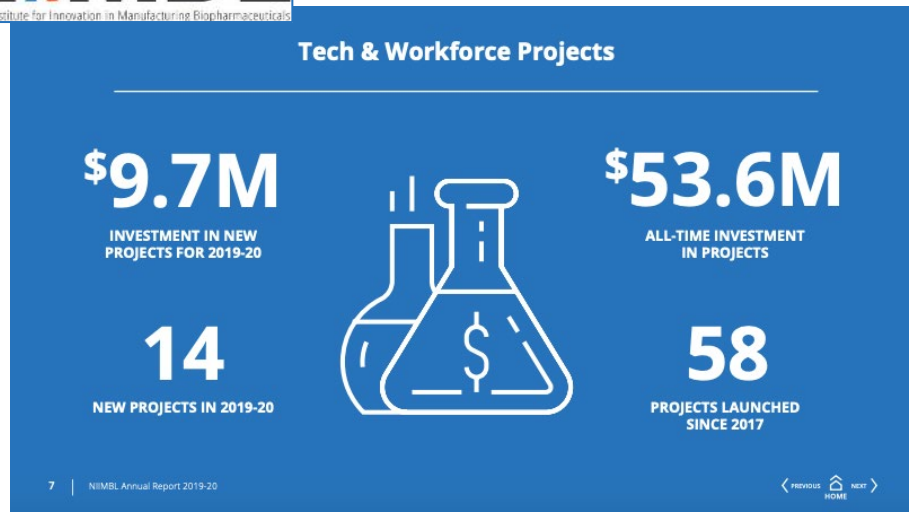
* Funding will be equally distributed across all programs and initiatives.

Manufacturing USA $166.7 M (+$150.2 M and 5 Positions)

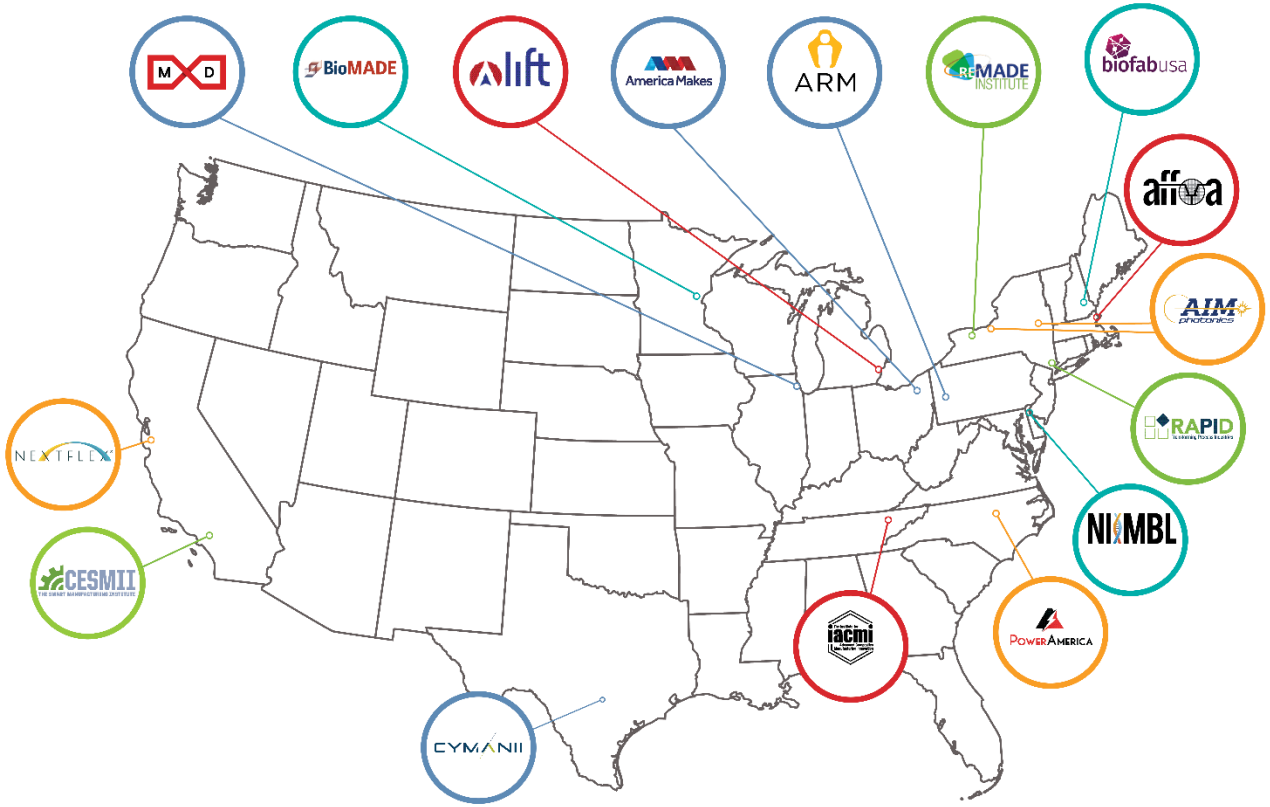
NIST coordinates the nationwide Manufacturing USA network of 16 innovation institutes

- $150 million will fund two additional Manufacturing USA Institutes in FY 2022
- $16.7 million continues base support for coordination, technology roadmaps, and sponsorship of the current NIST/DOC institute NIIMBL

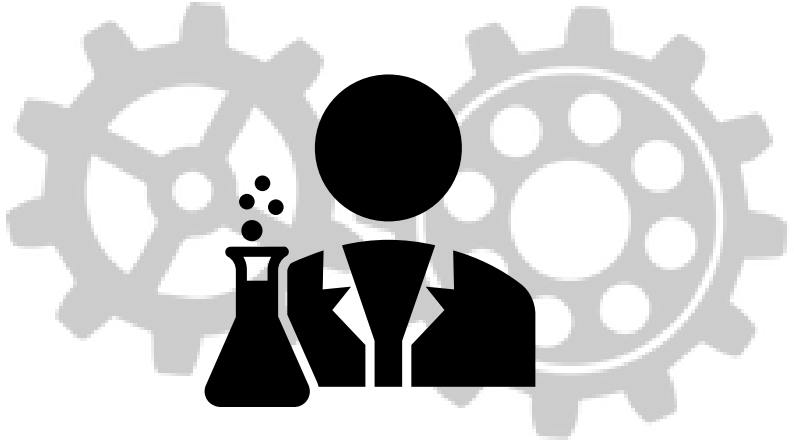
NIIMBL
The National Institute for Innovation in Manufacturing Biopharmaceuticals



Manufacturing USA



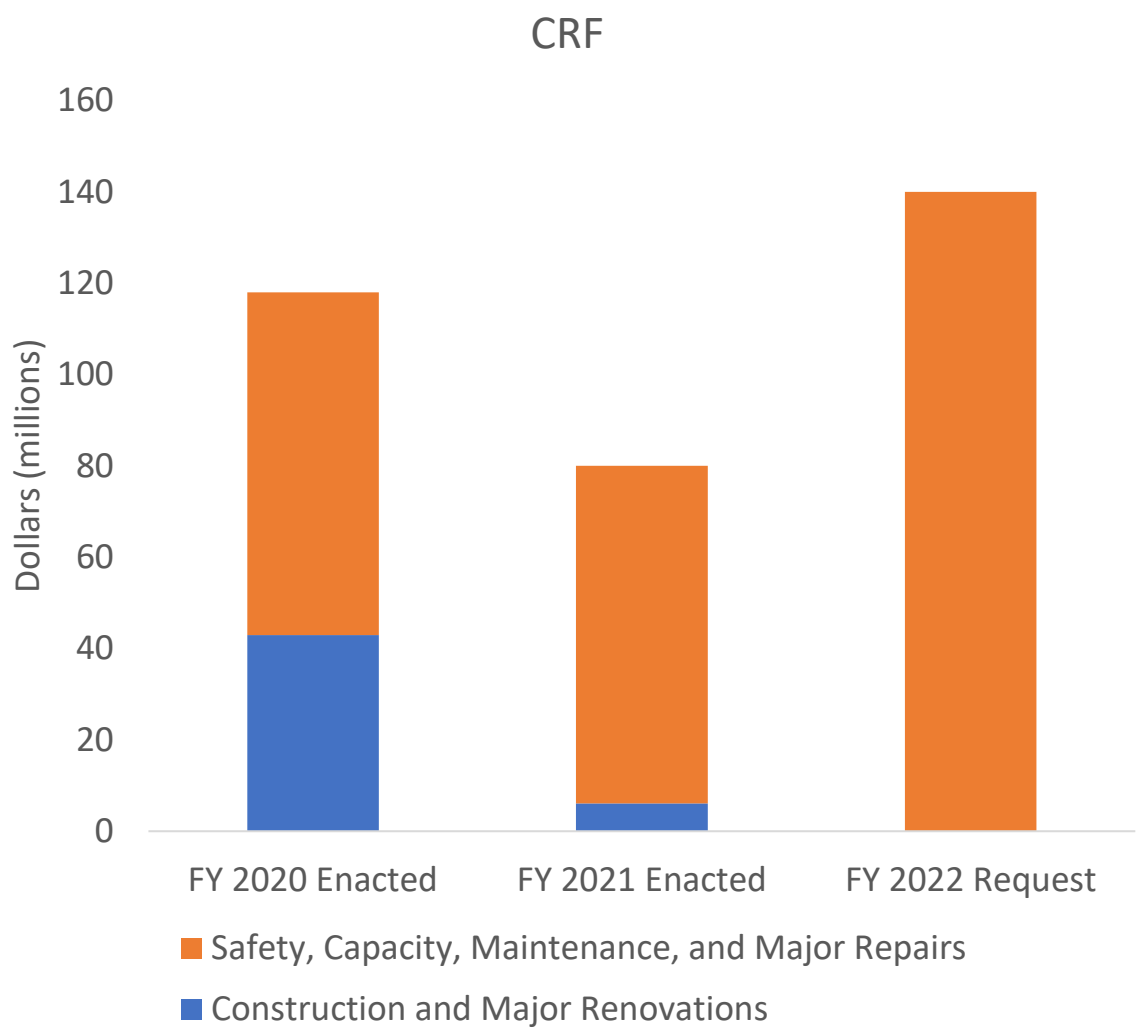
MEP, Manufacturing USA, and NIST Labs Synergy



Challenges	Opportunities	Impacts
• ***MFG USA:*** Secure U.S. global leadership in advanced manufacturing through large-scale collaboration on technology, supply chain, and workforce development • ***MEP:*** Enhance the productivity, technological performance and competitiveness of U.S. Manufacturing • ***Labs:*** collaborate with industry, academia, and other government agencies to develop the measurement and standards solutions to accelerate the development of the next generation of manufacturing technologies.	• Each program serves a different part of the innovation cycle  *Image Credit: NIST*	• All U.S. manufacturers have access to existing and new technology to improve their individual competitiveness • More of the U.S. workforce will be prepared with skills needed for manufacturing in the 21st Century • Laboratories will be better connected to manufacturing industries to develop and bring new technologies into use

CRF: $140.0 M (+$60.0 M and 0 Positions)

- Supports staff salaries and recurring preventive maintenance contracts and materials
- Supports infrastructure improvements and research space enhancement, ensuring that NIST can have a leading-edge R&D program to advance U.S. innovation
- Supports addressing major utility infrastructure maintenance backlog and modernization of the IT networking infrastructure



NDAA/CHIPS Act and DOC

- Lays out a comprehensive set of programs to:
  - Protect and extend US semiconductor technology leadership
  - Ensure a secured supply of chips for critical, non-commercial US sectors; and
  - Promote economic viability of US industry in R&D, manufacturing, and other critical parts of the semiconductor value chain.

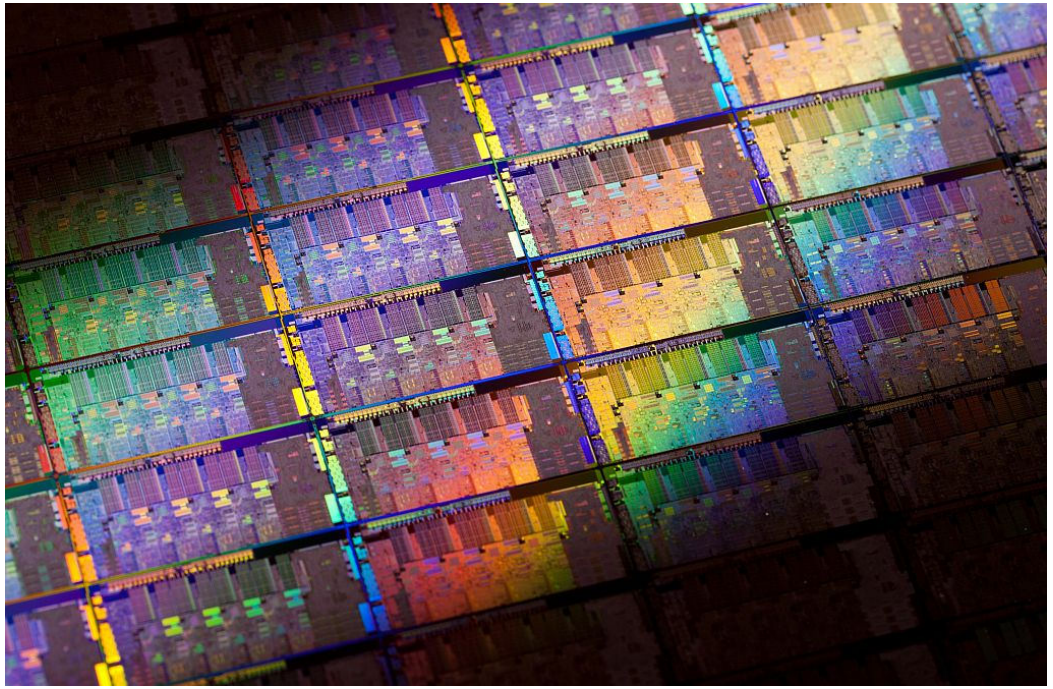
USICA Proposes $52B in appropriations for programs

	FY 2022	FY2023	FY2024	FY2025	FY2026
Section 9902 Incentives Program	19	5	5	5	5
Section 9906 c National Semiconductor Technology Center	2				
Section 9906 d Advanced Packaging Program	2.5	2	1.3	1.1	1.8
Section 9906 e NIST Metrology Program	0.5				
Section 9906 f Manufacturing USA Institute					

Planning for Implementation

Cross NIST, DOC, and WH Teams Developing Plans for Implementation

- Establishment of Program Office
  - Staffing plans
  - Structure
- Design of incentives and oversight (NOFOs and competition processes for Incentive Program)
- NSTC
- Planning for cross NIST Metrology Program
- Planning for Advanced Manufacturing Institute



Questions

Climate and Energy Measurements, Tools, and Testbeds (+$20.0 M and 39 Positions)

These funds will enable NIST to address climate and energy needs across four themes:

- BUILDING RESILIENTLY for the changing climate through research supporting building codes and standards; programs addressing the challenge of heating and cooling, low-energy buildings, indoor air quality, and solar cell and energy storage technologies ($7.5 M)
- SMART GRID INNOVATIONS for clean energy and climate resilience, addressing key Smart Grid advancements to support widespread adoption of electric vehicles ($3.7 M)
- URBAN DOME program will expand the Northeast Corridor Testbed with public and private partners to include more locations, accelerating the development of integrated models ($3.8 M)
- CARBON CAPTURE AND SEQUESTRATION expanded efforts in Direct Air Capture and other innovative concepts using specialized neutron measurement capabilities built for use by climate researchers across the nation ($5 M)

Image Credit: NIST

Image Credit: Pixabay

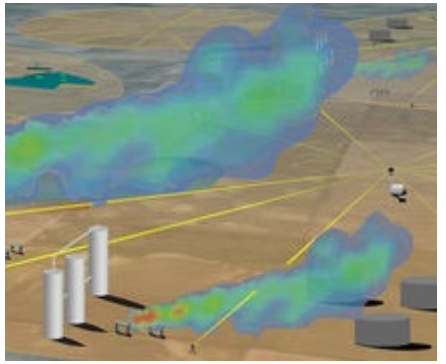


Image Credit: NIST

Image Credit: Climeworks

Advanced Communications Research and Standards (+$12.0 M and 29 Positions)

With additional funding NIST will:

- Support the development of standards needed to accelerate the deployment of next-generation advanced communications technologies to broad applications and stakeholders
- Create fundamental measurements, data, and tools for next-generation wireless systems
- Support staff engagement in international standards development activities to better champion U.S. government and industry priorities

Insatiable societal demand for connectivity necessitates innovative approaches to address the current spectrum crunch

High-speed, next-generation wireless communications are critical to U.S. economic competitiveness

NIST has key partnerships, facilities, and expertise to address advanced communications needs for 5G and beyond

Quantum Information Science, Engineering, and Metrology (+$ 15.0 M and 19 Positions)

With additional funding NIST would:

Support creation of the quantum engineering ecosystem (+9.5 M)

- Expand quantum network testbed program
- Develop a new quantum material program including new instrumentation for essential neutron-based measurements

Work to develop and bring cutting-edge quantum-based measurement-science technology and expertise to broad stakeholders (+$2.5 M)

Increase capacity through expanded joint institute partnerships and postdoctoral research program (+$3 M)

American leadership in quantum science and engineering is critical to economic and national security

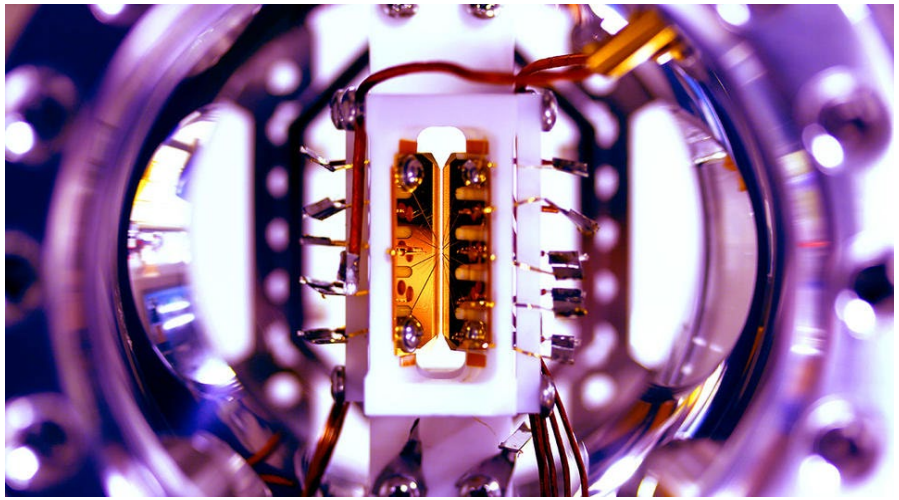


Image Credit: E. Edwards/JQI and S. Debnath/IonQ

Partnerships, Research, and Standards to Advance Trustworthy Artificial Intelligence (+$15.0 M and 16 Positions)

"Americans have not yet grappled with just how profoundly the artificial intelligence (AI) revolution will impact our economy, national security, and welfare. Much remains to be learned about the power and limits of AI technologies. Nevertheless, big decisions need to be made now to accelerate AI innovation to benefit the United States and to defend against the malign uses of AI."

-Final Report, National Security Commission on Artificial Intelligence

Increased funding for NIST will:

- Establish a new public-private partnership AI Collaborative Institute with academia, industry, and government to accelerate technically sound standards and solutions for trustworthy AI ($10 M)
- Expand research capacities to build confidence and trust in AI systems, grow the technical staff, and establish a national materials data network in collaboration with the NIST Advanced Materials Center of Excellence ($5 M)

Supporting the American Bioeconomy (+$14.0 M and 27 Positions)

NIST will support the development of a strong U.S. bioeconomy through:

- Developing systems to Design/Build/Test/Learn systems to accelerate advancements in engineering biology ($5 M)
- Researching biomanufacturing for precision medicine and emerging therapeutics ($5 M)
- Integrating biological data with artificial intelligence and machine learning systems ($ 3.75 M)
- Robust participation of NIST experts in standards development organizations for bioeconomy ($0.25 M)

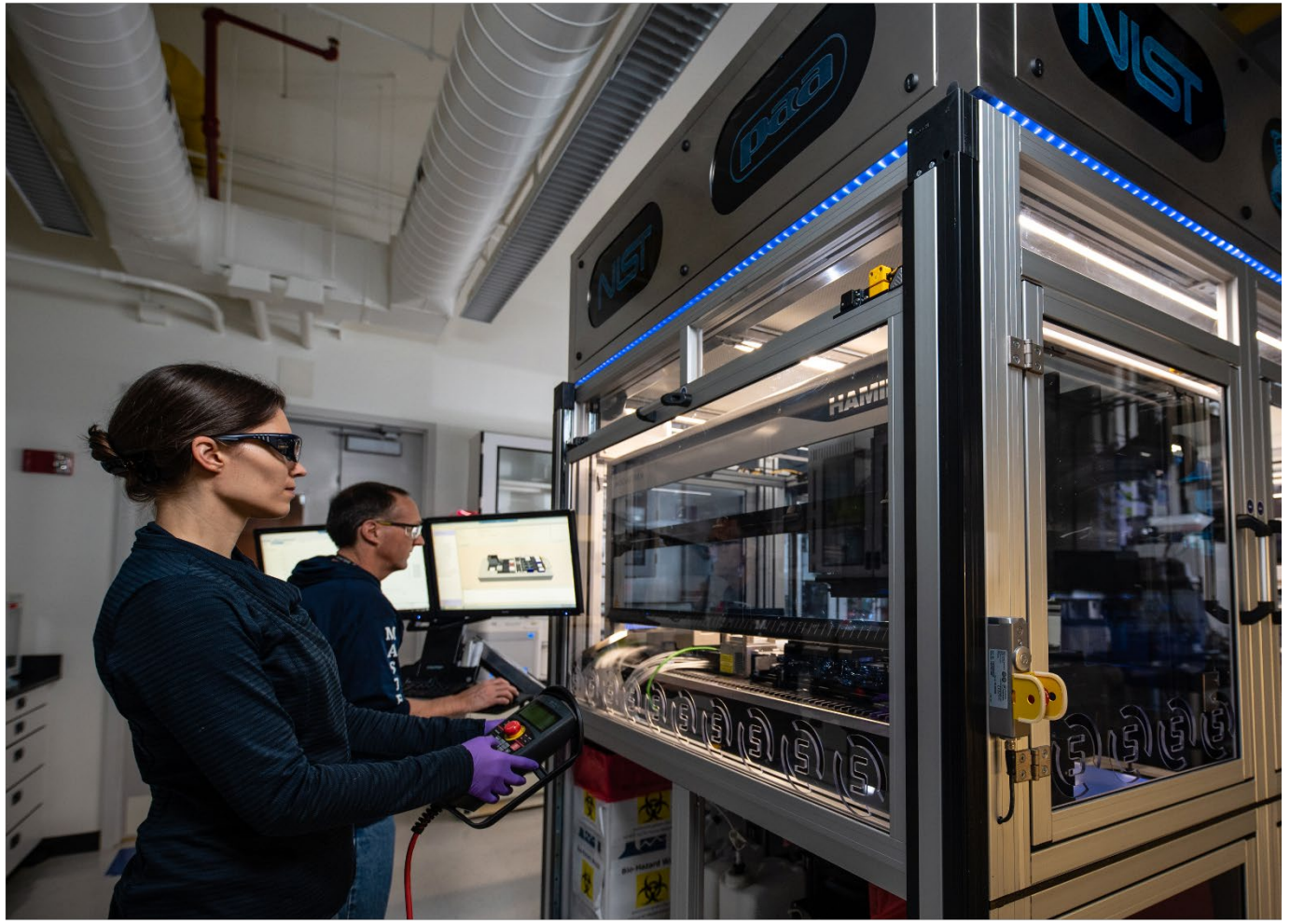
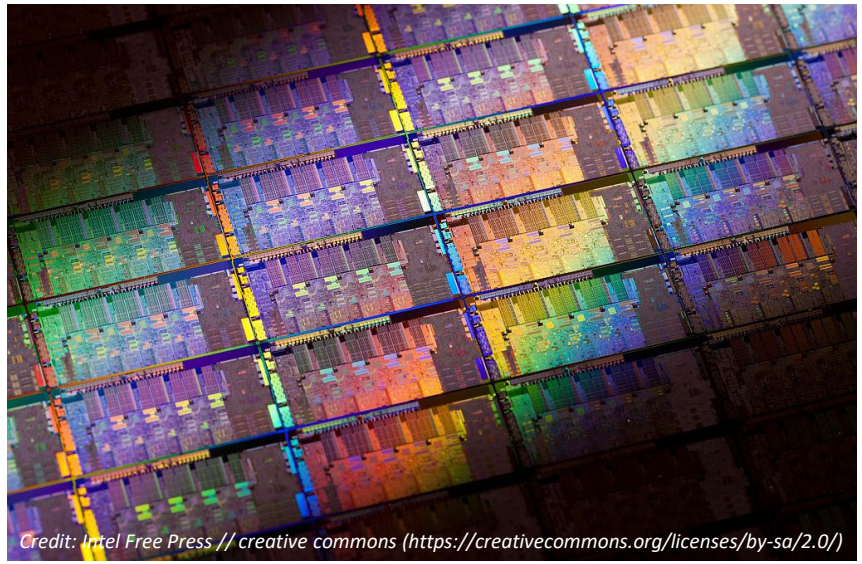


Image Credit: J. Stoughton/NIST

Next-generation Semiconductor Research and Standards (+$10.0 M and 11 Positions)


Credit: Intel Free Press // creative commons (https://creativecommons.org/licenses/by-sa/2.0/)

With additional funding NIST will:

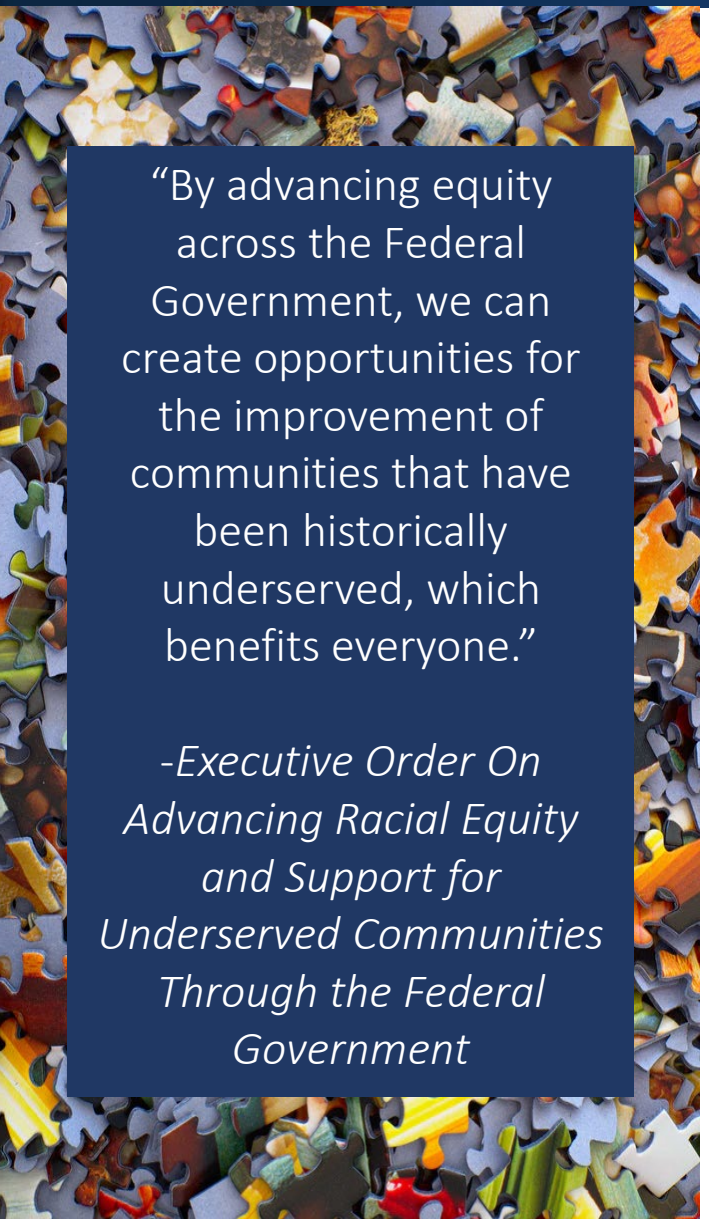
- Establish a new research program to characterize physical properties and develop nanoscale processing interactions for semiconductors (+$7 M)
- Upgrade the NIST nanofabrication facilities and analysis tools for internal and external users (+$3 M)

Semiconductor chip manufacturing expected to grow 56 % by 2030

Semiconductors and microelectronics power the industries of the future

NIST has key partnerships, facilities, and expertise to develop and characterize new semiconductor technologies

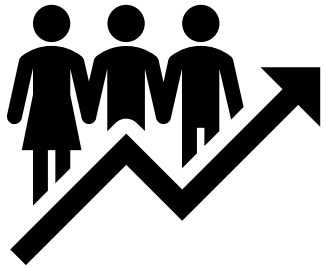
Strengthening Equity and Diversity in the Standards Workforce (+$5.143 M and 14 Positions)



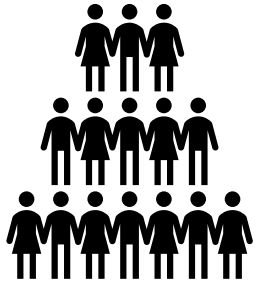
"By advancing equity across the Federal Government, we can create opportunities for the improvement of communities that have been historically underserved, which benefits everyone."

-Executive Order On Advancing Racial Equity and Support for Underserved Communities Through the Federal Government

With this request, NIST will support the development of a diverse American workforce and build pipelines for the next generation of innovative scientists and engineers:



- Establish a Metrology Grants Program for Minority Serving Institutions (MSIs) to create metrology training programs and curricula



- This Program would provide training for over 100 students across 1-3 universities each year, plus metrology training for at least two faculty/Principal Investigators per university to promote collaborative research projects

Circular Economy Research Program (+$5.0 M and 9 Positions)

Image Credit: Pixabay

With additional funding NIST will:

- Build on its polymer science program to improve identification and sorting technology using machine learning and imaging, create reference data for industry ($4 M)
- Expand efforts to tackle manufacturing and processing needs for other classes of high-value materials ($1 M)

Economic losses loom for U.S. companies: trade restrictions on single-use plastics, and high-value materials in landfill waste

NIST program will create measurements and data for recovery, sorting, and recycling of plastics and other materials in our supply chains

NIST will begin with research to support multiuse, high-value, recyclable plastics

Hollings Manufacturing Extension Partnership $275 M (+$125.0 M and 58 Positions)

The FY 2022 budget request increases federal funding for NIST MEP, nearly doubling the program

- Increases core funding to MEP Centers
- Reflects MEP's plans for increased capabilities to respond to critical needs
  - MEP National Supply Chain Initiative
  - MEP National Workforce Development Initiative
  - MEP Manufacturing Technology Demonstration Facilities

$13.0 BILLION in New and Retained Sales

$4.9 BILLION in Total investment in U.S. Manufacturing

$2.7 BILLION in Cost Savings

MEP Budget Increase Supports E.O. 14017

"Resilient American supply chains will revitalize and rebuild domestic manufacturing capacity, maintain America's competitive edge in research and development, and create well-paying jobs."

Administration Priorities COVID-19 Briefing Room

BRIEFING ROOM

Executive Order on America's Supply Chains

FEBRUARY 24, 2021 • PRESIDENTIAL ACTIONS

By the authority vested in me as President by the Constitution and the laws of the United States of America, it is hereby ordered as follows:

Section 1. Policy. The United States needs resilient, diverse, and secure supply chains to ensure our economic prosperity and national security. Pandemics and other biological threats, cyber-attacks, climate shocks and extreme weather events, terrorist attacks, geopolitical and economic

- Analyze supply chain for critical sectors and subsectors of the ICT industry
- Conduct supply chain mapping
- Identify the critical goods and materials part of supply chains, the capabilities needed to produce them, and alternative sourcing
- Identify domestic manufacturing capabilities gaps
- Identify risks that may disrupt supply chains
- Identify ways to make supply chains more sustainable
- Identify workforce skill gaps and develop best practices to meet future workforce needs

MEP National Supply Chain Initiative


Image Credit: Pixabay

The COVID-19 pandemic highlighted a U.S. dependency on global supply chains for industrial and consumer goods.

Significant gaps exist in the domestic manufacturing base.

A lack of manufacturing supply chain resiliency undermines U.S. national and economic security.

The MEP National Supply Chain Initiative will:

- Partner with federal agencies and industry stakeholders to ID supply chain gaps
- With more manufactures served, map critical manufacturing supply chains (E.O. 14017)
- Expand MEP Supplier Scouting to ID and assist new sources of domestic supply and reduce Buy America waivers (E.O. 14005)
- Increase individual manufacture resiliency by addressing issues that precludes them from entering new supply chains

Impacts:

- U.S. supply chains will be more resilient at the overall manufacturing level and at the individual manufacturer level
- More robust U.S. options and strategies for supply chains
- More visibility into lower tiers for improved supply chain optimization
- Improved supply chain risk management
- Increased manufactures' diversification of customers and markets
- Improved manufacturer operational agility and global competitiveness

MEP National Workforce Development Initiative

As many as 2.1 million manufacturing jobs will be unfilled through 2030

Worker shortage will hurt revenue, production, and could ultimately cost the U.S. economy up to $1 trillion by 2030

Manufacturers struggle to fill jobs that require technical training or applied skills

Manufactures must improve how they attract diverse talent from untapped sources

Image Credit: iStock/xavierarnau

The MEP National Workforce Development Initiative will:

- Enhance MEP's ability to help manufactures attract a new workforce, create innovative on-ramps, and work with community leaders to overcome economic barriers
- Provide MEP Centers resources for upskilling a diverse workforce focused on women and underrepresented groups
- Assist manufacturers with career development pathways that recruit and retain talent

MEP Manufacturing Technology Demonstration Facilities

Manufacturing accounts for 11% of total US economic output

Nearly 99% of all US manufacturing establishments are small-to-medium sized manufacturers (SMMs) with <500 employees. They employ 70% of the domestic manufacturing workforce

SMM technical sophistication lags that of large companies

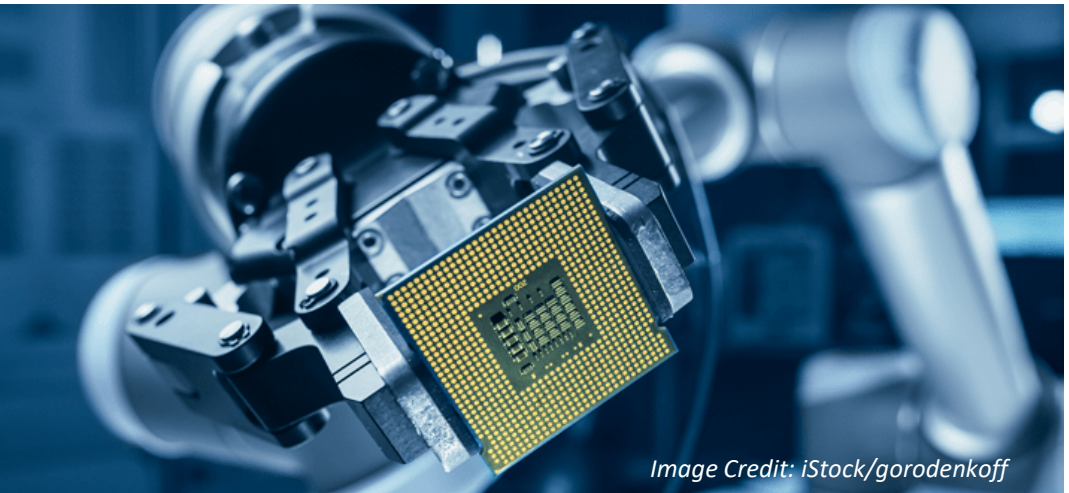


Image Credit: iStock/gorodenkoff

MEP MTDFs will:

- Implement critical technologies to make key products (E.O. 14017)
- Expose SMMs to advanced technology, train on its use, work hands-on with experts to prove out processes and product ideas for integration into specific manufacturing environments
- Expand the MEP Assisted Technology and Technical Resource (MATTR) service to increase SMM leverage of technical expertise and resources available at NIST, as well as other federal and non-federal labs

Impacts:

- Higher technology adoption rates by SMMs in supply chains for key products and critical technologies (E.O. 14017):
  - Industry 4.0, AI, IoT, additive manufacturing
  - Cybersecurity
  - Broadband technology
  - Semiconductors
  - Food
  - Medical equipment
- Increased SMM productivity
- More technically skilled workers for SMMs