ADVANCED MANUFACTURING

Advanced Manufacturing Funding

(Dollars in Millions)

	FY 2021 Actual	FY 2022 (TBD)	FY 2023 Request
BIO	$7.16	-	$17.16
CISE	44.40	-	42.22
EDU[1]	22.19	-	5.00
ENG	123.65	-	174.37
MPS	193.42	-	123.13
SBE	0.50	-	3.50
TIP[2]	44.30	-	54.63
OISE	0.26	-	0.50
IA	16.24	-	1.00
Total	**$452.11**	**-**	**$421.51**

[1] Formerly known as Directorate for Education and Human Resources (EHR).

[2] FY 2021 funding for TIP is shown for comparability across fiscal years.

Overview

Manufacturing is essential to almost every sector of the U.S. economy, spurring the economy by increasing productivity, enabling new products, and opening new industries. Advanced manufacturing uses innovative technologies to create products and processes with higher performance, fewer resources, and/or new capabilities. NSF programs accelerate advances in manufacturing materials, technologies and systems through fundamental, multidisciplinary research that transforms manufacturing capabilities, methods, and practices.

Since its founding in 1950, NSF has pushed the frontiers of manufacturing, sparking breakthroughs from nanomaterials and computer-aided design to 3D printing and blockchain, as well as tools for real-time, in situ feedback and sensing. NSF investments in advanced manufacturing have increased and will continue to increase U.S. prosperity, as well as the Nation's competitiveness, security, and quality of life (as measured through a growing advanced manufacturing workforce and translation of discovery to useful products).

Today, NSF continues to invest in fundamental research to create new and sustainable capabilities for chemical and materials synthesis and processing; fabrication and manufacturing of advanced semiconductors, quantum devices, and optical devices; discovery and manufacture of alternative materials with lower climate and environmental impacts; distributed and smart manufacturing systems; safe, productive, and collaborative worker-technology interactions; the ethical, social, economic, and legal consequences of advanced manufacturing; and general advanced manufacturing discovery. NSF invests in communities and experiential programs to grow and nurture a STEM-enabled manufacturing workforce and in industry partnerships and entrepreneurship to speed manufacturing innovations to the marketplace.

NSF's advanced manufacturing research intersects, builds upon, and contributes to related investments in biotechnology, synthetic biology, sustainability, artificial intelligence, robotics, sensing technologies, the Internet of Things, data science, and computational modeling. Similarly, NSF's

investments in Clean Energy, Climate Change and Emerging Technologies are bolstered by advanced manufacturing research.

Goals

1. *Advanced Manufacturing Research*: Support groundbreaking discoveries for advanced manufacturing that lead to products and processes with higher performance, new capabilities, and using fewer and more-sustainable resources.
2. *Future Manufacturing Research*: Increase knowledge in emerging areas to enable a new generation of manufacturing industries that do not exist today, that are compatible with human needs, that make U.S. manufacturing competitive far into the future, and that build in resilience to global disruptions for the Nation's manufacturing infrastructure.
3. *Workforce Development*: Attract, educate, train and reskill/upskill diverse workers, from K-12 to college and industry, across the Nation, for the manufacturing workforce of the future.
4. *Translation to Practice*: Leverage partnerships with other sectors to enable the translation of research results to the market and society.

FY 2023 Investments

Advanced Manufacturing Research
Continued investments in advanced manufacturing include the discovery of new methods, processes, analyses, tools, or equipment for new or existing manufacturing products, supply-chain components, or chemicals and materials, including replacements for environmentally harmful mainstay materials such as plastics. NSF also supports research in next-generation manufacturing infrastructure as part of a broader effort to design and renew national infrastructure.

Future Manufacturing Research
Initiated in FY 2020, the Future Manufacturing investment advances fundamental research to enable manufacturing that (a) does not exist or is not possible today, or (b) exists or is possible only at such small scales that it is not yet viable for mass production. Investments focus on cyber-, eco- and bio-manufacturing research advances.

Workforce Development
To prepare a diverse advanced manufacturing workforce, NSF invests in the Advanced Technological Education, Faculty Early Career Development, Engineering Research Initiation, Grant Opportunities for Academic Liaison with Industry, Sites and Supplements for both Research Experiences for Undergraduates and Research Experiences for Teachers programs, as well as in manufacturing engineering education in research projects. NSF support for Non-Academic Research Internships for Graduate Students (INTERN) provides individuals with experiences in other sectors, including industry and government.

Translation to Practice
NSF speeds translation of fundamental discoveries in advanced manufacturing into products and processes through its Engineering Research Centers, Industry-University Cooperative Research Centers, as well as the NSF Lab-to-Market Platform and other activities in TIP. In addition, NSF coordinates with other agencies and participates in the Manufacturing USA Institutes, particularly by connecting them to universities and community colleges.