

DIRECTORATE FOR ENGINEERING (ENG)**\$808,140,000****ENG Funding**
(Dollars in Millions)

	FY 2023		FY 2025 Request	Change over	
	Base	FY 2024		FY 2023 Base Plan	Percent
	Plan ¹	(TBD)		Amount	
Chemical, Bioeng, Enviro & Transport Systems (CBET)	\$200.50	-	\$201.84	\$1.34	0.7%
Civil, Mechanical & Manufacturing Innovation (CMMI)	235.84	-	237.15	1.31	0.6%
Electrical, Communications & Cyber Systems (ECCS)	121.32	-	121.99	0.67	0.6%
Engineering Education & Centers (EEC)	132.12	-	132.85	0.73	0.6%
Emerging Frontiers & Multidisciplinary Activities (EFMA)	107.79	-	114.31	6.52	6.0%
Total	\$797.57	-	\$808.14	\$10.57	1.3%

¹ For comparability with FY 2025, the FY 2023 levels do not include this organization's share of Mission Support Services that were funded through the R&RA and EDU directorates and offices.

About ENG

In FY 2025, ENG will spur engineering breakthroughs to help ensure future U.S. prosperity, resilience, security, health, and technological leadership. ENG will invest in groundbreaking fundamental engineering research and in key Administration and NSF-wide research priorities. Substantial directorate investments—in cross-NSF priority areas as well as the fourth generation of NSF Engineering Research Centers (ERCs)—will emphasize convergence research approaches to help address grand challenges and achieve societal impact. In addition, to advance U.S. global competitiveness, strategic ENG support will strengthen the engineering workforce and accelerate the development of technological innovations.

ENG's FY 2025 investments will build future prosperity through essential contributions to research on advanced manufacturing, supply chains, biomanufacturing for health and other innovative applications; nanotechnologies, new materials and semiconductor technologies; and clean energy technologies and climate change adaptation and mitigation strategies, including sustainable regional systems, innovations for decarbonization and the circular economy, natural hazards resilience, and partnerships for clean energy technology frontiers. The directorate will support advances in robotics, AI, and smart and autonomous systems. ENG will also invest in novel technologies to advance spectrum-efficient advanced wireless systems and energy-efficient high-performance microelectronics and computing. Funding across ENG will help ensure sustainable and reliable infrastructure systems through, for example, precision agriculture and designs for extreme conditions. Continued investments in research infrastructure and partnerships will provide researchers and students with access to testbeds, fabrication, and scale-up that speed technology translation.

To speed the translation of research results to economic and societal benefits, ENG will build on its tradition of collaboration with industry and other government agencies and laboratories. Through the NSF-funded Engineering Research Visioning Alliance, engineers with broad perspectives identified key research directions in reports on *Sustainable Transportation Networks*, *Engineered Systems for Water*

Security, and Engineering the Future of Distributed Manufacturing in 2023.¹ The directorate supports both direct and indirect partnerships, such as the ERC, Industry–University Cooperative Research Center (IUCRC), Grant Opportunities for Academic Liaison with Industry (GOALI) investments. Working with the TIP directorate, ENG will spur the engineering research community to follow existing well-established pathways towards technology translation and implementation. In addition, ENG will work closely with TIP to develop new translation pathways, building on and enhancing existing successes in our center programs (ERC and IUCRC). Research results from ENG’s mid-size convergent research awards create new opportunities that are ripe for translational impact.

ENG funding will help protect Americans by continuing long-term support for engineering research and the Natural Hazards Engineering Research Infrastructure (NHERI) to improve resilience to hurricanes, fires, earthquakes, windstorms, and other potential disasters. ENG will help secure and advance communications, computing, and sensing through investments in QIS-related programs for quantum technologies and systems. Other ENG-funded research will investigate methods and technologies for protecting the electric grid, detecting biological threats, and optimizing supply networks.

ENG will advance health technologies through investment in fundamental research to observe nanoscale cellular processes and changes, engineering biology to reverse disease and produce therapies, artificial intelligence for health technologies, and synthetic biology to advance a wide array of biotechnologies. The directorate also will support research on the transport of contaminants and pathogens in natural and built environments, methods to detect and monitor their presence, and the prevention and understanding of their impacts on the community and ecology. Engineering investments will continue advances in prosthetic and assistive technologies for veterans, senior citizens, and people with disabilities.

To speed and strengthen U.S. technological innovation and competitiveness, ENG will invest in workforce development, education, and scientific leadership across the nation. The directorate will support research on engineering education, student opportunities for hands-on research and training, and professional development and mentoring activities. ENG, together with other NSF directorates and offices, will support research, education, and workforce development that remove barriers, build capacity, and foster partnerships. ENG will continue to invest in the Broadening Participation in Engineering program and the Engineering Research Initiation program, encourage research by MSIs and EPSCoR institutions, and promote systemic changes that enhance diversity, equity, and inclusion in engineering. ENG will maintain its commitment to talented students and faculty through programs supporting transitions between career stages and opportunities for mid-size, interdisciplinary team research. ENG investments in academic partnerships and professional development opportunities with industry will help bring new ideas from lab to market and fortify the Nation’s innovation ecosystem.

¹ www.ervacommunity.org/report-category/full-reports/

Major Investments

ENG Major Investments

(Dollars in Millions)

Area of Investment ^{1,2}	FY 2023			Change over	
	Base Plan	FY 2024 (TBD)	FY 2025 Request	FY 2023 Base Plan Amount	Percent
Advanced Manufacturing	\$125.00	-	\$130.63	\$5.63	4.5%
Advanced Wireless Research	25.00	-	26.13	1.13	4.5%
Artificial Intelligence	88.00	-	91.96	3.96	4.5%
Biotechnology	92.00	-	96.14	4.14	4.5%
BaRP: Clean Energy Technology	193.00	-	201.69	8.69	4.5%
Improving Undergraduate STEM Education	5.00	-	5.00	-	-
Microelectronics/Semiconductors	43.00	-	44.94	1.94	4.5%
Quantum Information Science	29.50	-	30.83	1.33	4.5%
Secure & Trustworthy Cyberspace	3.25	-	3.25	-	-

¹Major investments may have funding overlap and thus should not be summed.

²This table reflects this directorate's support for selected topics. Investment priorities and presentation may differ by organization and so should not be summed across narratives.

To learn more about cross-agency themes and initiatives supported by ENG, including Advanced Manufacturing, Advanced Wireless, Artificial Intelligence, Biotechnology, BaRP (Clean Energy Technology), Microelectronics/Semiconductors, Quantum Information Science, and Secure and Trustworthy Computing, see individual narratives in the NSF-Wide Investments chapter.

ENG is an agency-wide steward of these topical areas:

- **Advanced Manufacturing:** With ENG leadership, NSF investments accelerate advances in manufacturing materials, technologies, and systems to create products and processes with higher performance, greater sustainability, and new capabilities, as well as prepare our manufacturing workforce. The Future Manufacturing program catalyzes new manufacturing capabilities that do not exist today. For more information, see the Advanced Manufacturing narrative in the NSF-Wide Investments chapter.
- **BaRP: Clean Energy Technology:** With ENG leadership, NSF advances Net-Zero Goals by enabling new understanding and innovations to support energy efficiency, enhance sustainability, adapt to and mitigate climate change, spawn new industries, and support translation and partnerships for innovation, as well as education and workforce development. For more information, see the Climate: Clean Energy Technology narrative in the NSF-Wide Investments chapter.
- **Microelectronics/Semiconductors:** With ENG leadership, NSF enables new paradigms in microelectronics and semiconductor capabilities. Activities advance materials, devices, circuits, architectures, fabrication, manufacturing, and related software and applications. NSF invests in secure, sustainable, high-performance semiconductors; semiconductor packaging and microelectronic device integration; R&D ecosystems; and workforce development. For more information, see the Microelectronics/Semiconductors narrative in the NSF-Wide Investments chapter.

Centers Programs

ENG Funding for Centers Programs

(Dollars in Millions)

	Division	FY 2023	FY 2024	FY 2025	Change over	
		Base Plan	(TBD)	Request	FY 2023 Base Plan Amount	Percent
Artificial Intelligence Research Institutes	Multiple	\$7.45	-	\$4.00	-\$3.45	-46.3%
Engineering Research Centers	Multiple	68.70	-	79.11	10.41	15.2%
STC: Sci. & Tech. for Phosphorus Sustainability	CBET	5.00	-	5.00	-	-
STC: Center for Mechanobiology	CMMI	5.00	-	5.00	-	-
Total		\$86.15	-	\$93.11	\$6.96	8.1%

For detailed information on individual centers programs, please see the Cross Theme Topics section of the NSF-Wide Investments chapter.

ENG Divisions

ENG Division Funding by Category

(Dollars in Millions)

	FY 2023	FY 2024 (TBD)	FY 2025 Request	Change over	
	Base Plan			FY 2023 Base Plan Amount	Percent
Chemical, Bioeng, Enviro & Transport Systems (CBET)	\$200.50	-	\$201.84	\$1.34	0.7%
Research	195.31	-	196.65	1.34	0.7%
Education	1.50	-	1.50	-	-
Infrastructure	3.69	-	3.69	-	-
Civil, Mechanical & Manufacturing Innovation (CMMI)	\$235.84	-	\$237.15	\$1.31	0.6%
Research	218.19	-	219.50	1.31	0.6%
Education	2.95	-	2.95	-	-
Infrastructure	14.70	-	14.70	-	-
Electrical, Communications & Cyber Systems (ECCS)	\$121.32	-	\$121.99	\$0.67	0.6%
Research	115.08	-	115.75	0.67	0.6%
Education	0.90	-	0.90	-	-
Infrastructure	5.34	-	5.34	-	-
Engineering Education & Centers (EEC)	\$132.12	-	\$132.85	\$0.73	0.6%
Research	116.07	-	117.10	1.03	0.9%
Education	16.05	-	15.75	-0.30	-1.9%
Infrastructure	-	-	-	-	N/A
Emerging Frontiers & Multidisciplinary Activities (EFMA)	\$107.79	-	\$114.31	\$6.52	6.0%
Research	105.54	-	113.06	7.52	7.1%
Education	0.15	-	0.15	-	-
Infrastructure	2.10	-	1.10	-1.00	-47.6%

¹ For comparability with FY 2025, the FY 2023 levels do not include this organization's share of Mission Support Services that were funded through the R&RA and EDU directorates and offices.

Chemical, Bioengineering, Environmental, & Transport Systems (CBET) supports research and education to enhance and protect national health, energy, food, water, environment, manufacturing,

and security, by investing in areas involving the transformation and/or transport of matter and energy by chemical, thermal, or mechanical means. Through CBET, the physical, chemical, and biological sciences are integrated in engineering research and education, leading to advances in biotechnology, bioengineering, biomanufacturing, advanced materials, environmental engineering, climate adaptation and mitigation, and sustainable clean energy.

Civil, Mechanical, & Manufacturing Innovation (CMMI) funds fundamental research and education that advances civil, design, mechanical, industrial, systems, manufacturing, and materials engineering. In addition, the division has a focus on the reduction of risks and damage resulting from earthquakes, wind, and other hazards on the built environment and in the context of a socio-technical system. CMMI encourages discoveries enabled by cross-cutting technologies such as adaptive systems, artificial intelligence, robotics, nanotechnology, and high-performance computational modeling and simulation.

Electrical, Communications, & Cyber Systems (ECCS) supports transformative research at the nano, micro, and macro scales that fuel impacts on quantum, cyber and wireless technologies, sensing, clean energy and power systems, healthcare, transportation, robotics, advanced manufacturing, and other systems-related areas. The division's programs encompass novel electronic, photonic, quantum, and magnetic devices, including energy-efficient, sustainable, and secure semiconductors and microelectronics, and the integration of these devices into circuit and system environments, intelligent systems, control, and networks.

Engineering Education & Centers (EEC) invests in the creation of 21st century engineers and the discovery of new technologies through engineering education research, broadening participation in engineering, research and experiential learning opportunities for students and teachers, and transformational center-based research. EEC leads the signature ERC and IUCRC programs, which impact advanced manufacturing; biotechnology and health; agriculture; energy, sustainability, and infrastructure; and microelectronics, sensing, quantum, and information technology.

Office of Emerging Frontiers and Multidisciplinary Activities (EFMA) enables ENG to strategically pursue and support projects in important emerging areas. A central activity of EFMA is the Emerging Frontiers in Research and Innovation (EFRI) program, which funds interdisciplinary projects with potential for major impacts on national needs and/or grand challenges. EFMA also provides ENG with the necessary flexibility to invest in long-term challenges and to adapt as new challenges arise.

