

INTEGRATIVE ACTIVITIES (IA)

\$504,900,000
+\$120,020,000 / 31.2%

IA Funding¹
(Dollars in Millions)

	FY 2020				Change over	
	FY 2020 Actual	CARES Act Actual	FY 2021 Estimate	FY 2022 Request	FY 2021 Estimate Amount	Percent
Analysis, Modeling, and Forecasting	-	-	-	\$3.00	\$3.00	N/A
EPSCoR	190.32	1.25	200.00	239.64	39.64	19.8%
Evaluation and Assessment Capability	5.29	-	5.00	7.00	2.00	40.0%
Facility Operations Transition ²	-	-	-	12.00	12.00	N/A
Growing Convergence Research	15.90	0.30	16.00	24.17	8.17	51.1%
HBCU Excellence in Research	18.05	0.40	20.00	33.96	13.96	69.8%
Major Research Instrumentation	74.98	-	75.00	89.85	14.85	19.8%
Mid-scale Research Infrastructure	30.37	-	32.67	50.00	17.33	53.0%
NSF 2026	6.42	-	-	-	-	N/A
Planning and Policy Support	4.72	-	2.50	3.00	0.50	20.0%
Research Experiences for Undergraduates	0.03	-	-	-	-	N/A
Research Investment Communications	1.54	-	3.47	5.00	1.53	44.1%
Research Security Strategy and Policy	-	-	-	1.00	1.00	N/A
STC Class of 2021	-	-	25.00	30.00	5.00	20.0%
STC Admin	0.61	-	0.50	0.60	0.10	20.0%
Science & Technology Policy Institute	4.74	-	4.74	5.68	0.94	19.8%
Total	\$352.97	\$1.95	\$384.88	\$504.90	\$120.02	31.2%

¹ In FY 2022, the Graduate Research Fellowship Program is consolidated into the Directorate for Education and Human Resources and the NSF Convergence Accelerator moves to the Directorate for Technology, Innovation, and Partnerships. In the above, all years are shown in this new structure for comparability. See the EHR chapter and the R&RA Overview narrative for more information.

² In both the FY 2020 Current Plan and FY 2021 Estimate, \$10.0 million was distributed to the managing directorates. See the Facilities Overview narrative for more information.

About IA

IA investments catalyze transformative advances in science and technology by incubating new ideas and communities, supporting innovation in research and in NSF’s own processes, and promoting the integration of research and education. They enhance the competitiveness of the Nation’s research through activities that build capacity for science and engineering (S&E) and broaden participation in research and research training. They expand NSF’s capacity to use evidence for decision making.

IA stewards two Big Ideas, Growing Convergence Research (GCR) and Mid-scale Research Infrastructure (Track-1) activities between \$6 million and \$20 million. Jointly, these activities support innovative, transdisciplinary team science, advanced research infrastructure, use-inspired research, and emerging national research priorities.

IA provides funding for programs designed to enhance the ability of jurisdictions, institutions, and individuals to conduct globally competitive research. IA’s jurisdictional and institutional capacity-building programs include EPSCoR, NSF’s Historically Black Colleges and Universities Excellence in Research (HBCU-EiR) program, and the Major Research Instrumentation (MRI) program. The Alan T. Waterman honorary award grows the U.S. research enterprise by investing in and recognizing emerging talent. IA also supports Science and Technology Centers: Integrative Partnerships (STC), a program that promotes discovery and innovation through center-scale collaborative research and knowledge transfer.

Integrative Activities

IA promotes and supports the use of evidence in NSF decision making. IA leads strategic planning for evidence-building activities, compiles data on key NSF processes, and conducts or oversees studies of NSF activities to guide continuous improvements.

IA FY 2022 Activities

Analysis, Modeling, and Forecasting

- NSF will improve its analytical capability in support of advancing research, improving equity in science, and securing global leadership. NSF will expand its capacity to leverage modeling to generate timely and actionable insights to inform strategy, investments, and programmatic decisions. NSF will harness big data (both structured and unstructured) and data science (including artificial intelligence techniques such as machine learning) to automate analytical modeling in response to Agency priorities. These priorities include monitoring participation in NSF programs, promoting partnerships, and assessing the outcomes of NSF's investments to advance scientific discovery and achieve societal goals. Results of this work will provide valuable information to promote excellence in achieving NSF's mission.

Established Program to Stimulate Competitive Research

- EPSCoR investments assist NSF in its statutory function “to strengthen research and education in the sciences and engineering, including independent research by individuals, throughout the United States, and to avoid undue concentration of such research and education.”
- EPSCoR provides strategic programs and opportunities that stimulate sustainable improvements to EPSCoR jurisdictions' R&D capacity and capability. EPSCoR aims to stimulate research that enhances jurisdictional competitiveness in NSF disciplinary and multidisciplinary research programs, especially those that drive economic growth.

Evaluation and Assessment Capability

- EAC engages in strategic planning of evidence-building activities in support of the Agency's mission. This includes leading the development of the Agency's learning agenda, annual evaluation plan, inventory and analysis of evidence-building activities, and other activities that support the generation and use of evidence for decision making.
- EAC oversees or conducts evidence-building activities—including evaluations, research, statistics, and other types of studies and analyses—in response to questions prioritized in the Agency's learning agenda, in the annual evaluation plan, or by leadership and staff in response to emerging needs, as experienced this past year in response to COVID-19.
- At the FY 2022 Request level, increased funding will support studies prioritized in the Agency-wide learning agenda and focused on enabling program improvements that enhance the efficacy of NSF investments. This increase accompanies the growth of EAC to provide needed Agency-wide support that complements the work conducted by NSF directorates and offices.

Facility Operation Transition

- Facility Operation Transition reflects NSF's strategic commitment to a smooth transition from MREFC to O&M funding of new major facilities, as well as achievement of a balanced portfolio between facilities and investigator research, both of which were emphasized in the NSB's Congressionally requested 2019 report entitled “Study of Operations and Maintenance Costs for NSF Facilities” (NSB-2018-17).¹ The Facility Operation Transition funding will be used to (1) partially support initial O&M of new facilities so that the full O&M costs can be gradually absorbed into the managing division or directorate, and (2) partially support divestment of lower-priority facilities, the full cost of which may

¹ www.nsf.gov/pubs/2018/nsb201817/nsb201817.pdf

significantly impact individual division or directorate funding. For more information see the Facilities Overview narrative in the Major Facilities chapter.

Growing Convergence Research

- GCR supports basic research that uses novel, transdisciplinary approaches to solve complex problems. The unifying characteristics of these activities are that: (1) they have the potential to make a significant impact, either on fundamental understanding in S&E or on the Nation's ability to meet pressing societal challenges, or both; and (2) they require the deep integration of knowledge, tools, and ways of thinking from multiple disciplines. GCR also aims to grow the next generation of convergence researchers. In FY 2022, GCR investments will support four to seven new research collaborations and the continuation of four to seven projects begun in FY 2020. In addition, GCR will invest in research community-led activities to identify pressing, emerging research challenges that are large in scope, innovative in character, originate outside of any particular NSF directorate, and may require a long-term commitment. GCR will incubate the capacity of research teams to address these challenges. For more information about GCR, see the narrative in the NSF-Wide Investments chapter.

Historically Black Colleges and Universities – Excellence in Research

- The HBCU-EiR program focuses on improving the research capacity and competitiveness of HBCUs by supporting new research opportunities at these institutions. IA will fund up to 70 HBCU-EiR research grants managed by NSF's S&E directorates. In addition, the program builds capacity for research teams to succeed in center-scale competitions.

Major Research Instrumentation

- MRI invests in shared-use S&E research instrumentation. Approximately 170 new awards will support instrument development and acquisition in all of NSF's S&E domains. MRI's investments also contribute to research-intensive learning environments that enhance the training of a diverse S&E workforce and facilitate partnerships between academia and the private sector.

Mid-scale Research Infrastructure

- The Mid-scale RI (Track-1) activity funded through the IA budget within the R&RA account is one component of NSF's Mid-scale Research Infrastructure program. It aims to significantly advance the Nation's capabilities for conducting potentially transformative research and maintaining U.S. leadership in global S&E. Mid-scale RI-1 investments support: (1) the implementation of research infrastructure projects between \$6.0 million and \$20.0 million; and (2) the design of future research infrastructure projects. In FY 2022, \$50.0 million will be available for investment in Mid-scale RI-1 projects from the FY 2021 competition.

Planning and Policy Support (PPS)

- PPS includes funding for Proposal Management Efficiencies, which comprises activities such as the NSF biennial survey and studies of NSF's merit review process. PPS supports annual agency award activities (including the Alan T. Waterman Award and National Medal of Science) and summer science internship programs that target STEM students from underrepresented groups. PPS also provides funding to the National Academies of Science, Engineering, and Medicine (the National Academies) for the Committee on Science, Engineering, Medicine, and Public Policy (CoSEMPuP)², as well as studies, workshops, and letter reports spanning multiple research domains. The increase in FY 2022 invests in catalytic activities—workshops, conferences, and long-term planning exercises, focused on emerging themes and agency innovations—as well as capacity-building activities for national priorities.

² sites.nationalacademies.org/pga/cosepup/index.htm.

Integrative Activities

Research Investment Communications (RIC)

- RIC invests in leading-edge communication essential to build public and stakeholder awareness and support for S&E. RIC creates products and processes through various digital platforms to make NSF's investments in STEM readily available and easily understandable to everyone. In FY 2022, RIC informs policy makers, stakeholders, the media, and the general public about the impact of NSF's investments on their daily lives and the Nation's future.

Research Security Strategy and Policy

- NSF is expanding capabilities and competencies to protect the U.S. science and engineering enterprise through its Research Science Security and Policy activity. NSF is establishing new analytic capabilities to proactively identify conflicts of commitment, vulnerabilities of pre-publication research, and risks to the merit review system. To ensure clear understanding of research security issues, NSF disclosure requirements, and the tenets of beneficial international collaboration, NSF is developing training resources for staff. NSF is also partnering with the federal government interagency community to develop training resources for the research community. NSF's activities respond to the JASON report, "Fundamental Research Security," published in December 2019.

Science and Technology Centers: Integrative Partnerships Program

- The STC program supports innovative, potentially transformative, complex research and education projects that require large-scale, long-term awards. STCs engage the Nation's intellectual talent through partnerships across academia, industry, national laboratories, and government. These collaborations create synergies that enhance the training of the next generation of scientists, engineers, and educators. In FY 2022, \$25.0 million supports the second year of five Class of 2021 centers and \$5.0 million funds a sixth center in the Class of 2021 portfolio.
- STC Administration supports post-award management of STC awards, including site visits by review teams. FY 2022 funding includes program administration costs for the Class of 2023 competition.

Science and Technology Policy Institute (STPI)

- STPI is a Federally Funded Research and Development Center sponsored by NSF on behalf of the White House Office of Science and Technology Policy (OSTP). STPI provides analysis of significant domestic and international science and technology policies and developments for OSTP and other federal agencies.

Program Monitoring and Evaluation

The Performance and Management chapter provides details regarding the periodic reviews of programs and portfolios by external Committees of Visitors and directorate Advisory Committees. Please see this chapter for additional information.

**ESTABLISHED PROGRAM TO STIMULATE
COMPETITIVE RESEARCH (EPSCoR)**

**\$239,640,000
+\$39,640,000 / 19.8%**

EPSCoR Funding
(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate	
				Amount	Percent
Total	\$190.32	\$200.00	\$239.64	\$39.64	19.8%
Research Infrastructure Improvement	148.57	148.86	187.08	38.22	25.7%
Co-Funding	40.60	50.00	51.12	1.12	2.2%
Outreach and Workshops	1.15	1.14	1.44	0.30	26.3%

About EPSCoR

EPSCoR assists NSF in its statutory function “to strengthen research and education in science and engineering throughout the United States and to avoid undue concentration of such research and education.” EPSCoR seeks to advance excellence in science and engineering research and education, enhancing the competitiveness of EPSCoR jurisdictions in the science and engineering domains supported by NSF.

In general, about 15 percent of the EPSCoR portfolio is available to support new research grants. The remaining 85 percent supports grants made in prior years.

EPSCoR uses three strategic investment tools: Research Infrastructure Improvement (RII) awards, Co-Funding, and Outreach/Workshops.

Research Infrastructure Improvement (RII)

- RII investments support development of physical, human, and cyber-based research infrastructure in EPSCoR jurisdictions, with an emphasis on collaborations among academic researchers, the private sector, and state and local governments, to effect sustainable improvements in research infrastructure. RII projects are designed to improve the research competitiveness of jurisdictions by strengthening their academic research infrastructure in areas of S&E supported by NSF that are critical to the jurisdiction’s science and technology initiatives. RII projects increase the participation of underrepresented groups in STEM, enable broader regional and topical collaborations among jurisdictions, and facilitate the enhancement of discovery, learning, and economic development in EPSCoR jurisdictions. EPSCoR facilitates the engagement of its jurisdictions in S&E priority areas.
- In FY 2022, EPSCoR continues the RII Track-2: Focused EPSCoR Collaborations (RII Track-2 FEC), which builds inter-jurisdictional collaborative teams of EPSCoR investigators in scientific focus areas consistent with NSF priorities. These awards have a particular focus on the development of early career/junior faculty. In FY 2021 and FY 2022, proposals are invited on advancing research towards emerging industries to ensure economic growth for EPSCoR jurisdictions.
- In FY 2020, NSF EPSCoR established a memorandum of understanding with NASA EPSCoR with the goal of providing a new NSF/NASA activity within the existing RII Track-4: EPSCoR Research Fellows. This new opportunity, RII Track-4 Fellows Advancing in Science and Technology (RII Track-4 FAST), is intended to allow non-tenured PIs to further develop their individual research potential through extended collaborative visits to NASA Centers’ research facilities located throughout the U.S. This activity is planned for FY 2021 and FY 2022 and targets faculty at minority-serving institutions, women’s colleges, and primarily undergraduate institutions in EPSCoR jurisdictions.

Integrative Activities

Co-Funding

- EPSCoR co-funding enables awards in response to meritorious proposals from individual investigators, collaborative groups, and center-scale teams based in EPSCoR-eligible jurisdictions. These proposals are submitted across all of the Foundation’s research and education programs, including crosscutting initiatives, where they undergo merit review and are selected for award based on NSF’s intellectual merit and broader impact criteria. EPSCoR prioritizes co-funding for awards that advance its programmatic goals, including those supporting new investigators. In FY 2020, the program began placing increased emphasis on providing co-funding support for center-scale projects and those that make major, potentially transformational impacts toward physical and cyberinfrastructure and the development of a diverse STEM workforce within EPSCoR-eligible jurisdictions. This emphasis will continue in FY 2022; however, at a reduced level. EPSCoR co-funding ensures support for projects that might not be funded without the combined, leveraged resources of EPSCoR and the managing programs.

Outreach and Workshops

- The Outreach component of EPSCoR solicits requests for workshops, conferences, and other community-based activities. These are designed to explore opportunities in emerging areas of S&E and to share best practices in strategic planning, diversity, communication, and other capacity-building areas of importance in EPSCoR jurisdictions. EPSCoR also supports outreach travel that enables NSF staff from all directorates and offices to directly engage and inform the EPSCoR research community about NSF opportunities, priorities, programs, and policies.

Strategic Partnership and Evaluation Activities

- In FY 2022, NSF EPSCoR continues to implement a cohesive evaluation framework to study processes and outcomes that contribute to academic research competitiveness. EPSCoR will continue to identify and collect high-quality data from jurisdictions and will work with jurisdictions to use the framework to identify opportunities for increasing their competitiveness in NSF research programs and for other federal and private S&E funding.

People Involved in EPSCoR Activities

	FY 2020 Actual Estimate	FY 2020 CARES Act Actual Estimate	FY 2021 Estimate	FY 2022 Estimate
Senior Researchers	604	16	600	800
Other Professionals	90	1	100	100
Postdoctoral Associates	78	3	100	100
Graduate Students	449	10	500	600
Undergraduate Students	349	3	400	400
K-12 Teachers	2,543	-	2,700	3,200
K-12 Students	32,547	-	34,200	41,000
Total Number of People	36,660	33	38,600	46,200