

MAJOR FACILITIES OVERVIEW

Major Facilities Funding
(Dollars in Millions)

	FY 2022 Actual	Disaster Relief Supplemental			FY 2023 Estimate Total	FY 2024 Request	Change over FY 2023 Base Total ¹	
		FY 2023 Estimate Base	RI Damage Base	Mitigation			Amount	Percent
Total Research and Related Activities	\$996.89	\$970.94	\$44.23	\$2.50	\$1,017.67	\$1,084.91	\$69.74	6.9%
Operations and Maintenance of Existing Facilities	680.14	663.49	18.43	-	681.92	717.61	35.69	5.2%
Federally Funded Research and Development Centers	300.61	285.02	13.70	2.50	301.22	318.39	19.67	6.6%
Operations and Maintenance of Facilities under Construction	5.20	10.00	12.10	-	22.10	33.80	11.70	52.9%
R&RA Design Stage Activities	10.94	12.43	-	-	12.43	15.11	2.68	21.6%
Major Research Equipment and Facilities Construction	\$119.95	\$186.23	-	-	\$186.23	\$303.67	\$117.44	63.1%
Total, Major Multi-User Research Facilities	\$1,116.84	\$1,157.17	\$44.23	\$2.50	\$1,203.90	\$1,388.58	\$187.18	15.6%

¹ Captures both the FY 2023 Omnibus appropriation and the Disaster Relief Supplemental base.

NSF investments in major multi-user research facilities (major facilities) provide large, state-of-the-art tools for research and education. These can include instrumentation networks, observatories, accelerators, telescopes, research vessels, aircraft, and simulators. In addition, scientific use of cyber-enabled and geographically distributed facilities continues to increase as a result of rapid advances in computer, information, and communication technologies. NSF's investments are coordinated with those of other organizations, federal agencies, and international partners to ensure they are complementary and well-integrated. Planning, operations, and maintenance of major facilities are funded through the R&RA account. Most construction is funded through the MREFC account.

In FY 2018, NSF created the position of Chief Officer for Research Facilities in the Office of the Director, to enhance oversight of major facilities throughout their complete lifecycle. The individual in that position serves as the senior agency official whose responsibility is oversight of the development, construction, and operations of major facilities across the Foundation, as required by Section 110 of the American Innovation and Competitiveness Act (P.L. 114-329). In FY 2022, a Deputy Chief Officer for Research Facilities position was created to provide oversight for NSF's Mid-scale Research Infrastructure portfolio.

The Program Management Improvement and Accountability Act requires an annual NSF portfolio review integrated with an agency Strategic Review. In FY 2019, the NSF Strategic Review evaluated practices in funding NSF's Major Facilities and lessons learned from the FY 2019 lapse in appropriations. As a result, NSF established a requirement to have at least three months of funding obligated to the major facility awards to span potential periods of funding discontinuity, thus providing financial stability. The FY 2020 Strategic Review assessed options for improving NSF internal processes for the Development and Design Stages. The Office of the Director and the Large Facilities Office have implemented recommendations from this review, including collecting consistent information annually from all Divisions on projects in development to promote strategic awareness, building capacity in project management expertise for NSF staff and the research community through training opportunities and engagement, and clarifying the process for projects to enter the Design Stage at points beyond the Conceptual Design Phase. In FY 2022, the Strategic Review considered NSF's processes for the final lifecycle stage of facilities, termed Disposition. The Office of the Director and the Large Facilities Office are implementing recommendations from this review, including refining and consistently applying language related to disposition, developing processes for estimating the likely cost of the final lifecycle stage and clarifying expectations for how disposition will be funded and managed.

Major Facilities

The Facility Operation Transition activity proposed in IA is the fifth year of a pilot program that reflects NSF's strategic commitment to successful O&M of new major facilities as well as balancing portfolio funding between facilities and individual investigator research, both of which were emphasized in the NSB's Congressionally requested 2018 report entitled "Study of Operations and Maintenance Costs for NSF Facilities" (NSB-2018-17).¹ The funds in this activity 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 significantly impact individual division or directorate funding. In FY 2022, these funds supported facilities operations and maintenance costs in BIO (\$5.0 million) and MPS (\$5.0 million); in FY 2023, the allocation of these funds to specific organizations is pending approval of NSF's FY 2023 Current Plan.

This chapter provides descriptions of each major facility supported through the R&RA account and provides funding information by lifecycle phase for each facility. The information presented for each facility follows the overall framework established by NSF for major facility projects. Information on projects under construction that are funded through NSF's MREFC account is provided in the MREFC narratives. The following pages contain information on the budget requests for NSF's major facilities in FY 2024.

¹ National Science Board, *Study of Operations and Maintenance Costs for NSF Facilities* (NSB-2018-17), May 2018, www.nsf.gov/pubs/2018/nsb201817/nsb201817.pdf. FY 2021 Budget Request to Congress.

MAJOR FACILITIES FUNDING, BY PROJECT

(Dollars in Millions)

	FY 2022 Actual	Disaster Relief Supplemental			FY 2023 Estimate Total	FY 2024 Request	Change over FY 2023 Base Total ¹	
		FY 2023 Estimate Base	RI Damage Base	Mitigation			Amount	Percent
Operations and Maintenance of Major Facilities	\$985.95	\$958.51	\$44.23	\$2.50	\$1,005.24	\$1,069.80	\$67.06	6.7%
National Ecological Observatory Network (NEON)	69.01	71.71	-	-	71.71	78.04	6.33	8.8%
Biological Sciences	\$69.01	\$71.71	-	-	\$71.71	\$78.04	\$6.33	8.8%
Academic Research Fleet	116.39	116.68	10.43	-	127.11	129.23	2.12	1.7%
Geodetic Facility for the Advancement of GEoscience (GAGE)	13.94	14.05	0.50	-	14.55	15.18	0.63	4.3%
International Ocean Discovery Program (IODP)	51.70	50.40	-	-	50.40	52.77	2.37	4.7%
National Center for Atmospheric Research (NCAR) FFRDC	104.64	110.31	5.89	-	116.20	134.41	18.21	15.7%
Ocean Observatories Initiative (OOI)	45.13	45.00	6.00	-	51.00	53.36	2.36	4.6%
Seismological Facility for the Advancement of GEoscience (SAGE)	21.87	21.87	1.50	-	23.37	24.40	1.03	4.4%
Geosciences	\$353.67	\$358.31	\$24.32	-	\$382.63	\$409.35	\$26.72	7.0%
Arecibo Observatory ²	12.19	6.00	-	-	6.00	6.00	-	-
Green Bank Observatory (GBO) FFRDC ³	15.53	9.12	1.71	-	10.83	9.55	-1.28	-11.8%
Large Hadron Collider (LHC) - ATLAS and CMS	21.51	20.50	-	-	20.50	20.50	-	-
Laser Interferometer Gravitational Wave Observatory (LIGO)	45.00	45.00	-	-	45.00	50.00	5.00	11.1%
National High Magnetic Field Laboratory (NHMFL) ³	38.91	39.91	-	-	39.91	38.57	-1.34	-3.4%
National Radio Astronomy Observatory (NRAO) FFRDC ^{3,4}	102.72	91.16	2.50	-	93.66	98.35	4.69	5.0%
NRAO O&M ⁵	52.09	40.53	2.50	-	43.03	43.59	0.56	1.3%
Atacama Large Millimeter Array (ALMA) O&M	50.63	50.63	-	-	50.63	54.76	4.13	8.2%
National Solar Observatory (NSO) FFRDC ³	26.54	25.46	1.10	-	26.56	27.67	1.11	4.2%
NSO O&M	6.96	5.88	-	-	5.88	6.24	0.36	6.1%
Daniel K. Inouye Solar Telescope (DKIST) O&M	19.58	19.58	1.10	-	20.68	21.43	0.75	3.6%
NSF's Nat'l Optical-Infrared Astronomy Res. Lab. (NOIRLab) FFRDC ³	56.38	58.97	14.60	2.50	76.07	82.21	8.64	11.7%
NOIRLab O&M (Mid-Scale Obs. & Community Science & Data Ctr) ⁶	25.80	25.99	2.50	2.00	30.49	23.68	-4.81	-16.9%
GEMINI Observatory O&M	25.38	22.98	-	0.50	23.48	24.73	1.75	7.6%
Vera C. Rubin Observatory O&M	5.20	10.00	12.10	-	22.10	33.80	11.70	52.9%
Mathematical and Physical Sciences	\$318.78	\$296.12	\$19.91	\$2.50	\$318.53	\$332.85	\$16.82	5.3%
Antarctic Facilities and Operations (AFO)	237.23	224.71	-	-	224.71	241.55	16.84	7.5%
IceCube Neutrino Observatory (ICNO)	7.26	7.66	-	-	7.66	8.01	0.35	4.6%
Office of Polar Programs	\$244.49	\$232.37	-	-	\$232.37	\$249.56	\$17.19	7.4%
Major Research Facilities Construction Investments	\$130.89	\$198.66	-	-	\$198.66	\$318.78	\$120.12	60.5%
R&RA Design Stage Activities⁷	\$10.94	\$12.43	-	-	\$12.43	\$15.11	\$2.68	21.6%
Major Research Equipment and Facilities Construction (MREFC)	\$119.95	\$186.23	-	-	\$186.23	\$303.67	\$117.44	63.1%
Total	\$1,116.84	\$1,157.17	\$44.23	\$2.50	\$1,203.90	\$1,388.58	\$187.18	15.6%

FFRDC is an acronym for Federally-Funded Research and Development Center.

¹ Captures both the FY 2023 Omnibus appropriation and the Disaster Relief Supplemental base.

² Arecibo: In FY 2024, NSF will transition from a cooperative agreement for operations of Arecibo Observatory to a contract for maintenance of the site.

³ Funding for FY 2023 and FY 2024 does not include potential additional funding that may be provided by MPS' Office of Strategic Initiatives (formerly Office of Multidisciplinary Activities) for deferred maintenance projects.

⁴ NRAO: Included within NRAO's total funding is NSF's contribution to VLBA at \$3.43 million per year.

⁵ NRAO: Includes funding for the ngVLA program office.

⁶ NOIRLab: Includes support for the Windows on the Universe Center for Astronomy Outreach, ongoing activities at the WIYN telescope, and potential future participation in the U.S. Extremely Large Telescope program.

⁷ Includes development and design costs for the Leadership-Class Computing Facility (LCCF) of \$3.50 million in FY 2022 and \$7.44 million, \$12.43 million, and \$15.11 million for the Antarctic Research Vessel (ARV) in FY 2022, FY 2023, and FY 2024, respectively.