

**MAJOR RESEARCH EQUIPMENT AND FACILITIES CONSTRUCTION
ACCOUNT (MREFC)**

\$300,000,000

Major Research Equipment and Facilities Construction Funding
(Dollars in Millions)

FY 2023		Change over		
Base Plan	FY 2024 Request	FY 2025 Request	FY 2023 Base Plan Amount	Percent
\$187.23	\$304.67	\$300.00	\$112.77	60.2%

Overview

The MREFC account supports the acquisition, construction, and commissioning of major facilities and larger mid-scale research infrastructure that provide unique capabilities at the frontiers of science and engineering. Initial development and design and post-construction operations and maintenance are funded through the R&RA account.

MREFC Account Funding, by Project
(Dollars in Millions)

	FY 2023 Base Plan	FY 2024 Request	FY 2025 Request	FY 2026 Estimate	FY 2027 Estimate	FY 2028 Estimate	FY 2029 Estimate	FY 2030 Estimate
Antarctic Infrastructure Recapitalization (AIR)	\$60.00	\$60.00	\$60.00	\$60.00	\$60.00	\$60.00	\$60.00	\$60.00
HL-Large Hadron Collider Upgrade	33.00	38.00	-	-	-	-	-	-
Leadership-Class Computing Facility (LCCF)	-	93.00	154.00	226.00	47.00	-	-	-
Mid-scale Research Infrastructure, Track 2 ²	76.25	105.06	85.00	90.00	100.00	100.00	100.00	100.00
Regional Class Research Vessel (RCRV)	1.98	-	-	-	-	-	-	-
Vera C. Rubin Observatory (Rubin)	15.00	7.61	-	-	-	-	-	-
Future Priority Projects ³	-	-	-	8.00	206.00	264.00	289.00	339.00
Dedicated Construction Oversight	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total	\$187.23	\$304.67	\$300.00	\$385.00	\$414.00	\$425.00	\$450.00	\$500.00

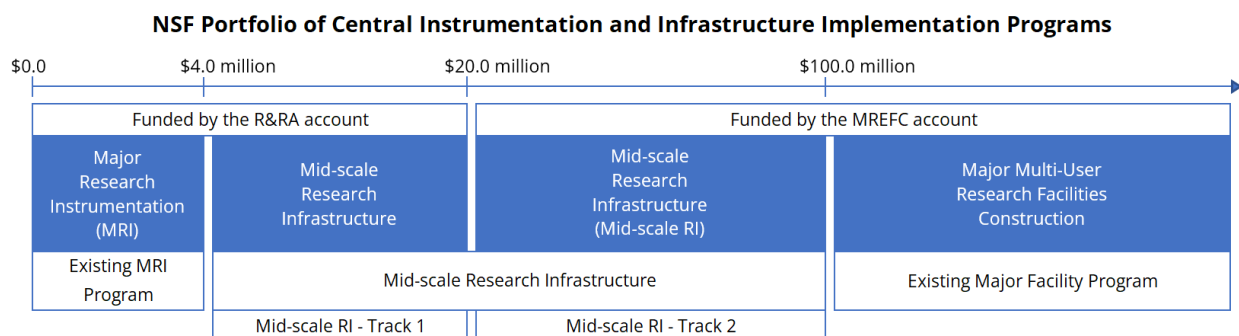
¹ A total of \$361.32 million was carried forward from FY 2023 to FY 2024: \$74.04 million for Mid-scale RI, \$209.76 million for AIR, \$8.53 million for RCRV, \$39.07 million for HL-LHC Upgrade, \$20.89 million for Rubin, and \$1.58 million for Dedicated Construction Oversight. The remaining \$7.45 million consists of funds from recoveries from old projects not funded in FY 2023.

² Outyear amounts are for planning purposes only. NSF will evaluate Mid-scale RI in the context of agency priorities for future budget submissions.

³ Represents escalating funding amounts increasing NSF's MREFC portfolio to a total of \$500.0 million by the end of the decade and does not reflect policy decisions on project-specific investments. Increases reflect both anticipated growth in cost of major research infrastructure, as well as NSF's intent to increase investments in facilities to maintain U.S. leadership in key science and engineering research areas.

Modern and effective research infrastructure is critical to maintaining U.S. international leadership in science and engineering. The future success of entire fields of research depends upon access to new generations of powerful research tools. Over time, these tools are becoming larger and more technically complex and often have significant information technology or cyberinfrastructure components. To be considered for MREFC funding, NSF requires that a major multi-user research facility (major facility) project represent an exceptional opportunity to enable research and education. The project should be transformative in nature, with the potential to shift the paradigm in scientific understanding. The major facility projects included in this budget request meet these criteria based on NSF and National Science Board review. The mid-scale research infrastructure projects funded through this budget line are evaluated separately as described in a distinct section below.

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The graphic above summarizes NSF's centralized instrumentation and infrastructure programs. Information presented in this chapter focuses on the items funded at levels above \$20.0 million, through the MREFC account. All Mid-scale Research Infrastructure (RI) – Track 2 (Mid-scale RI-2) investments are managed as a single portfolio, with projects selected from submissions to a dedicated program solicitation that are evaluated using NSF's merit review process. The NSF-established thresholds for Mid-scale RI-2 projects and major facilities construction projects are consistent with definitions in the 2017 American Innovation and Competitiveness Act (AICA), as amended by the National Defense Authorization Act (NDAA) for FY 2021.

In FY 2025, NSF requests a total of \$300.0 million to support mid-scale research infrastructure, and continued construction on two ongoing major facility projects: Antarctic Infrastructure Recapitalization (AIR) and the Leadership-Class Computing Facility (LCCF). For more information on each major facility project, see the individual narratives later in this chapter.

Major Facilities

Since FY 2009, major facility projects funded through the MREFC account have been subject to NSF's "no cost overrun" policy. To implement this policy, NSF processes and procedures assure the development of realistic and well-supported total project cost estimates so that approved budgets for the award recipient are sufficient to accomplish the project's scientific objectives. The current policy, as published in NSF's Research Infrastructure Guide (RIG), requires that: (1) the total project cost estimate when exiting the preliminary design phase includes adequate contingency to cover foreseeable risks manageable by the recipient; (2) any cost increases not covered by contingency be accommodated first by reductions in scope, with any significant scope reductions reviewed by NSF prior to implementation; and (3) if the project is approved to continue and further scope reductions become too detrimental to science, then the first 10 percent of any cost increase must be covered by the sponsoring directorate through R&RA funding. NSF holds the risk to total project cost for unforeseen events that are beyond the recipient's control. The COVID-19 pandemic, for example, constituted such an unforeseen event for all major facility construction projects. NSF policy allows for both authorization of management reserve and re-baselining, with a subsequent increase in total project cost, to address the consequences of such unforeseen events. The overall NSF response to COVID-19 for its major facilities is described at the end of this section.

Mid-scale Research Infrastructure

AICA required the agency to develop a strategy for supporting research infrastructure with a total project cost above the upper limit for the MRI program (\$6.0 million including cost sharing) and below

the lower threshold for a major facility project, which was then at \$70.0 million. NSF assessed community demand via a Request for Information¹ that resulted in the submission of approximately \$10 billion in ideas for projects in the cost range of \$20.0–\$100.0 million. After evaluating that community input, existing funding (or award) mechanisms, and implementation options, NSF included a dedicated funding line within the MREFC account beginning in FY 2020 for research infrastructure projects in the \$20.0–\$70.0 million range. Projects between \$6.0 and \$20.0 million in total project cost are addressed by individual directorates and through an NSF-wide program (Mid-scale RI-1) that draws its heritage from the NSF-wide MRI program. The CHIPS and Science Act of 2022 waives the required cost-sharing for the MRI program for a period of five years, effectively lowering the maximum award amount to \$4.0 million. Thus, NSF has lowered the threshold for Mid-scale RI-Track 1 proposals to \$4.0 million in response, starting with the most recent solicitation (NSF 22-637). The upper limit for Mid-scale RI-2 was increased to \$100.0 million in FY 2021 to align with the lower threshold for a major facility project, as specified in the FY 2021 NDAA that amended the original AICA definition. This funding line supports upgrades to major facilities as well as stand-alone projects.

Dedicated Construction Oversight

All major facility projects funded through the MREFC account undergo periodic cost, schedule, and risk reviews as required by the RIG and the terms and conditions of the cooperative agreements or contracts governing the projects. NSF policies and routine reporting are designed to ensure timely and reliable tracking of progress, including monitoring of project schedule and cost (*via* Earned Value Management metrics) and use of contingency, ensuring that program managers and recipients each have timely information to provide sufficient oversight and management authority, respectively, to meet project objectives.

Enhanced oversight of the construction stage includes mandatory incurred cost audits, Earned Value Management System surveillance, and independent cost estimates of re-baseline proposals, as well as other audits and reviews based on NSF's annual major facility portfolio risk assessment. These efforts are conducted by NSF and are generally not attributable to a specific project at the time of budget formulation, nor are they part of the total project cost developed and managed by the recipient. To properly support and transparently account for these efforts, actual costs and future estimates for Dedicated Construction Oversight are shown separately from the costs of individual projects in the MREFC account table above.

Oversight of the mid-scale research infrastructure projects is more flexible and is tailored to the technical nature and complexity of each project. All mid-scale research infrastructure projects funded through the MREFC account are required to provide a detailed Project Execution Plan for review. The RIG discusses that the detailed oversight requirements, and application of major facility oversight practices, depend on characteristics such as the technical scope, type and mix of work performed, and assessment of the technical and programmatic risks.

Future Major Facility Projects

NSF is actively supporting the development and design of several potential future major facility

¹ NSF 18-013: Dear Colleague Letter: Request for Information on Mid-scale Research Infrastructure. Available at <https://nsf.gov/pubs/2018/nsf18013/nsf18013.jsp>

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projects, through the R&RA account, in addition to the new infrastructure it is building through the MREFC account. Advancement of some of these projects to the Construction Stage is anticipated in future years, but the current state of readiness of these projects is not sufficient to reliably predict which will advance and at what time, nor to formally report a budget profile. Therefore, for planning purposes, placeholder estimates for future MREFC account funding needs have been incorporated into outyear projections for FY 2026 and beyond.

Beyond the costs of potential future major facility projects currently under review, NSF also anticipates that the size of its requests for the MREFC account will further increase to a total of \$500.0 million by the end of the decade. This increase reflects both the anticipated growth in the cost of major research infrastructure, and NSF's intent to increase its investments in facilities to maintain U.S. leadership in key science and engineering research areas. This proposed outyear funding estimate additionally allows for a more predictable annual request within the MREFC account.