

## MID-SCALE RESEARCH INFRASTRUCTURE (MID-SCALE RI)

Mid-scale RI Funding			
(Dollars in Millions)			
	FY 2020	FY 2021	FY 2022
	Actual	Estimate	Request
Mid-scale RI-1 (R&RA)	\$30.37	\$32.67	\$50.00
Mid-scale RI-2 (MREFC)	-	76.25	76.25
<b>Total</b>	<b>\$30.37</b>	<b>\$108.92</b>	<b>\$126.25</b>

### Overview

The Mid-scale RI program is an NSF-wide effort to meet the research community’s needs for modern research infrastructure at a scale that is otherwise difficult for individual institutions to acquire. Mid-scale RI implements agile mechanisms for funding experimental research capabilities costing between \$6.0 million and \$100.0 million.<sup>1</sup> The objectives are to transform scientific and engineering research fields with new infrastructure, while simultaneously training early-career researchers in the development, design, construction, and use of cutting-edge infrastructure.

The scientific importance of mid-scale research infrastructure is reflected in the 2017 American Innovation and Competitiveness Act (AICA), which directed NSF to “evaluate the existing and future needs, across all disciplines supported by the Foundation, for mid-scale projects.” NSF issued a Request for Information in late 2017 that resulted in nearly 200 ideas for research infrastructure within a project cost range of \$20 million to \$100 million. Subsequently, FY 2018 appropriations report language directed the NSB to “consider steps to bridge the gap between NSF’s Major Research Instrumentation (MRI) program and the agency’s MREFC account.”<sup>2</sup> Responding to this direction, the NSB report, “Bridging the Gap: Building a Sustained Approach to Mid-scale Research Infrastructure and Cyberinfrastructure at NSF”,<sup>3</sup> highlights that:

“The research community has identified mid-scale research infrastructure as a key enabler of scientific advances on shorter timescales than required for the larger projects funded within the MREFC account. ... Infrastructure investments at the required mid-level can also help maintain the United States’ standing among global partners and competitors.”

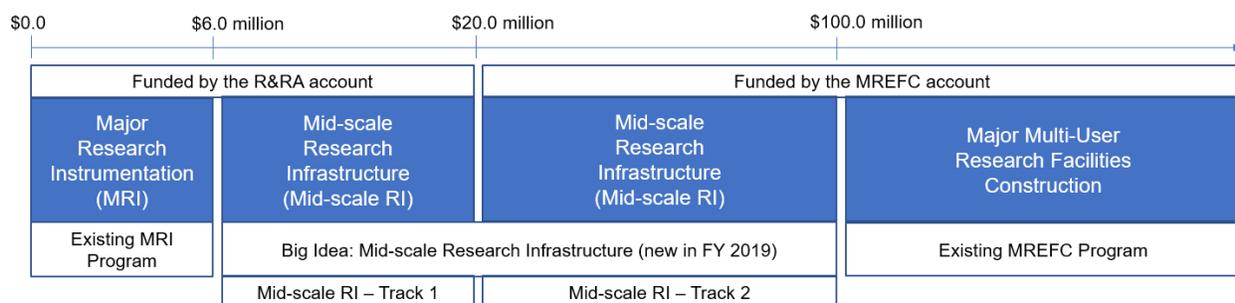
The graphic below shows NSF-wide instrumentation and infrastructure programs. Information presented in this narrative focuses on the Mid-scale RI components, Mid-scale RI - Track 1 (Mid-scale RI-1) and Mid-scale RI - Track 2 (Mid-scale RI-2). Information on the complementary MRI program may be found in the IA narrative, while information on major multi-user research facility construction projects may be found in the MREFC chapter. The Mid-scale RI program supports the implementation of research infrastructure at scales that are above what is possible through the MRI program and below major multi-user research facilities construction. Mid-scale RI-2 awards are funded by the MREFC account and are distinguished from Mid-scale RI-1 awards by their scale, potential risks, and the resulting NSF oversight.

<sup>1</sup> NSF-established thresholds for Mid-scale Track-2 projects have been updated to align with the definitions in AICA and the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021.

<sup>2</sup> At that time, the MREFC accounts was only used for major facilities. With the introduction of the Mid-Scale RI-2 program, the MREFC account is used for some mid-scale research infrastructure projects and for major facilities.

<sup>3</sup> [www.nsf.gov/nsb/publications/2018/NSB-2018-40-Midscale-Research-Infrastructure-Report-to-Congress-Oct2018.pdf](http://www.nsf.gov/nsb/publications/2018/NSB-2018-40-Midscale-Research-Infrastructure-Report-to-Congress-Oct2018.pdf)

**NSF Portfolio of Central Instrumentation and Infrastructure Implementation Programs**



In FY 2019, NSF received proposals in response to two Mid-scale RI funding opportunities. One included an opportunity to propose Mid-scale RI implementation projects with a total NSF project cost between \$6.0 million<sup>4</sup> and \$20.0 million, as well as infrastructure design projects with costs between \$600,000 and \$20.0 million, while a second included an opportunity to implement projects with a total NSF cost between \$20.0 million and \$70.0 million.

NSF made ten Mid-scale RI-1 awards, including the acquisition of the first 1.2GHz nuclear magnetic resonance system in the U.S.; extremely fast and powerful lasers; a neutron spin echo spectrometer, a part of the Center for High Resolution Neutron Scattering (CHRNS) jointly funded by NSF and the National Institute of Standards and Technology (NIST), to be deployed at NIST; a testbed for experiments for future internet designs; as well as support for the design of a future experiment to study the cosmic microwave background.

NSB authorized the first Mid-scale RI-2 awards at its May 2020 meeting and two additional awards at its February 2021 meeting. The first three awards were made in October 2020. These included a high-magnetic-field beamline at the Cornell High Energy Synchrotron Source, a global array of 500 robotic floats to regularly sample changes in ocean biogeochemistry, and a testing infrastructure for networked control of distributed energy resources. The two additional awards authorized in February 2021 are currently undergoing full cost analyses and final award negotiations, including Independent Cost Estimates and any potential impacts from COVID-19.

**Goals**

1. Provide access to cutting-edge mid-scale research infrastructure, including instrumentation.
2. Enable agile development and implementation of frontier scientific and engineering research infrastructure with a high potential to significantly advance the Nation’s research capabilities.
3. Train early-career scientists and engineers in the development and use of advanced research infrastructure.

**FY 2022 Investments**

In FY 2022, NSF will invest \$126.25 million in Mid-scale RI, split between Mid-scale RI-1 (\$50.0 million), funded through R&RA, and Mid-scale RI-2 (\$76.25 million), funded through MREFC. Both use a biennial funding opportunity; the second solicitations for Mid-scale RI-1 (NSF-21-505<sup>5</sup>) and Mid-scale RI-2 (NSF-21-537<sup>6</sup>) were issued in FY 2021. Subject to availability of funding in FY 2022, Mid-scale RI-1 will support projects from its FY 2021 competition. NSF anticipates that Mid-scale RI-2 funding will support projects

<sup>4</sup> Design activities to bring Mid-scale or larger projects to readiness for implementation may request a minimum of \$600,000.

<sup>5</sup> [www.nsf.gov/pubs/2021/nsf21505/nsf21505.htm](http://www.nsf.gov/pubs/2021/nsf21505/nsf21505.htm)

<sup>6</sup> [www.nsf.gov/pubs/2021/nsf21537/nsf21537.htm](http://www.nsf.gov/pubs/2021/nsf21537/nsf21537.htm)

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resulting from the first Mid-scale RI-2 competition that concluded in FY 2021 and also may be used to initiate new awards from the second Mid-scale RI-2 competition that began in FY 2021.