

REGIONAL CLASS RESEARCH VESSELS (RCRV)

\$1,980,000

**Appropriated and Requested MREFC Funds
for the Regional Class Research Vessel Project**

(Dollars in Millions)

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022 Request	FY 2023 Request	Total Project Cost
Previous Authorized Total Project Cost	\$121.88	\$105.00	\$127.09	-	-	-	-	\$353.97
Preliminary Estimate of COVID-19 Impact	-	-	-	-	-	5.00	1.98	6.98
Hurricane Ida Construction Impacts ¹	-	-	-	-	-	25.00	-	25.00
American Rescue Plan ²	-	-	-	-	14.05	-	-	14.05
Estimate prior to Rebaseline	\$121.88	\$105.00	\$127.09	-	\$14.05	\$30.00	\$1.98	\$400.00

¹ P.L 117-43, the "Extending Government Funding and Delivering Emergency Assistance Act", included \$25.0 million in one-time funding for necessary expenses related to RCRV construction impacted by Hurricane Ida.

² Includes \$14.05 million carried forward into FY 2022.

Brief Description

The Regional Class Research Vessel project is the NSF contribution to right-sizing and modernizing the U.S. Academic Research Fleet (ARF). It is expected that an ARF that includes three RCRVs will have sufficient usage to support efficient operation, while meeting regional demands. The first RCRV, R/V *Taani*, will be operated on the West Coast by Oregon State University (OSU). The second RCRV, R/V *Narragansett Dawn*, will be operated on the East Coast by the East Coast Oceanographic Consortium led by the University of Rhode Island. The third RCRV, R/V *Gilbert R. Mason*, will be operated in the Gulf of Mexico and nearby waters by the Gulf-Caribbean Oceanographic Consortium. The FY 2023 Request for the RCRV project is \$1.98 million.

Scientific Purpose

The 2015 National Research Council report, *Sea Change: 2015-2025 Decadal Survey of Ocean Sciences*,¹ (hereafter simply *Sea Change* report) described eight high-priority science questions that will be supported by the RCRVs in U.S. coastal waters:

1. What are the rates, mechanisms, impacts, and geographic variability of sea level change?
2. How are the coastal and estuarine ocean and their ecosystems influenced by the global hydrologic cycle, land use, and upwelling from the deep ocean?
3. How have ocean biogeochemical and physical processes contributed to today's climate and its variability, and how will this system change over the next century?
4. What is the role of biodiversity in the resilience of marine ecosystems and how will it be affected by natural and anthropogenic changes?
5. How different will marine food webs be at mid-century? In the next 100 years?
6. What are the processes that control the formation and evolution of ocean basins?
7. How can risk be better characterized and the ability to forecast geohazards like mega-earthquakes, tsunamis, undersea landslides, and volcanic eruptions be improved?

¹ www.nap.edu/read/21655/chapter/1

8. What is the geophysical, chemical, and biological character of the seafloor environment and how does it affect global elemental cycles and understanding of the origin and evolution of life?

The RCRVs were designed to support research to address each of the science questions and to meet the needs of researchers for work in coastal zones in support of biological, chemical, physical, and geological oceanography. The vessels will be capable of precise station-keeping for water column and sediment sampling, as well as supporting the use of remotely operated and autonomous vehicles. They will also enable virtual participation of shore-based scientists using telepresence-data presence technology, greatly expanding the potential user base. Each RCRV is expected to operate approximately 200-250 days per year, which is consistent with the optimal utilization for comparable ships in the ARF. Coordination of ARF scheduling is supported by the University-National Oceanographic Laboratory System (UNOLS).

Baseline History

The RCRV project is a major component in the plan for modernizing the ARF.² In 2001, a report from the Federal Oceanographic Facilities Committee documented the need for Regional Class vessels. In 2004, NSF and the Naval Sea Systems Command (NAVSEA) entered into an interagency agreement that resulted in two candidate designs for Regional Class ships. In 2007, the Federal Oceanographic Fleet Status Report identified the need for NSF-built Regional Class vessels to meet future science demand. In 2009, another National Academies report, *Science at Sea*, described the desirable characteristics of a modern Regional Class vessel. These characteristics and other science community factors were considered by the review panel when the preferred NAVSEA design was later down selected. In 2012, NSF issued a solicitation for the refreshed design and potential construction of RCRV. OSU was selected to manage the project and received the award in 2013. Input from external review panels, UNOLS, and the *Sea Change* report was received during the period 2013 to 2015 and informed the final decision to pursue construction. The *Sea Change* report recommended constructing only two of the three RCRV vessels originally planned, but Congress ultimately appropriated funding to build all three.

In 2015, the NSB authorized inclusion of funds to initiate construction for the RCRV project in future budget requests at the NSF Director's discretion. The Final Design Review was conducted in December 2016 and the panel recommended to NSF that the project was ready to advance to the construction stage. OSU subsequently awarded a contract for construction to Gulf Island Shipyards (now Bollinger Houma Shipyards; see below) based in Houma, LA for the first vessel with options for two more. NSF plans to fund the operations of the RCRVs within the overall projected budget for the ARF, partially leveraging savings from fleet right-sizing through the retirement of older and less capable vessels.

Prior to the COVID-19 pandemic, the RCRV project had been planned within an NSB-authorized Total Project Cost (TPC) of \$365.0 million. In FY 2017, \$121.88 million was appropriated to facilitate the construction of three vessels, followed by \$105.0 million in FY 2018 and \$127.09 million in FY 2019. To date, the measurable impacts of COVID-19 on the RCRV project have been modest, but future impacts are likely. In December 2020, the NSF Director increased the authorized TPC from the NSB-authorized

² National Ocean Council. Federal Oceanographic Fleet Status Report, 2013. https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/NSTC/federal_fleet_status_report_final.pdf

value of \$365.0 million to \$375.0 million to account for COVID-19 impacts that reduced the efficiency of the construction effort and increased the time to completion. In FY 2021, NSF approved the use of \$14.05 million in American Rescue Plan funds to address COVID-19 impacts on the RCRV project. The FY 2022 Request of \$5.0 million, in conjunction with the FY 2023 Request of \$1.98 million, to address continuing pandemic impacts, would increase the total appropriated RCRV funds to \$375.0 million. In FY 2022, \$25.0 million was appropriated to cover necessary expenses related to impacts of Hurricane Ida, which heavily damaged the area around the shipyard. The full extent of damages is still being evaluated.

Project Status

OSU is managing the construction of the RCRVs and transition to operations through a cooperative agreement with NSF, which encompasses the entire project, including tests and trials. The project is divided into four distinct phases, each to be funded through separate cooperative support agreements, with award of each phase contingent upon successful completion of the prior phase. These phases are:

Phase I: Project Refresh - **Complete**

Phase II: Shipyard Selection - **Complete**

Phase III: Construction - **In progress**

Phase IV: Transition to Operations - **Estimated Spring 2023**

The project completed Phase II in CY 2017, during which bids for construction of RCRV were solicited from U.S. shipyards and evaluated. The project is now in Phase III, construction. Keel-laying for the first RCRV, named *R/V Taani*, was completed in November 2018; for the second RCRV, named *R/V Narragansett Dawn*, in May 2019; and for the third RCRV, named *R/V Gilbert R. Mason*, in March 2020.

The RCRV project includes up to one year of sea trials and science equipment testing/trials for each vessel, after delivery from the shipyard, to ensure readiness to conduct science operations safely and efficiently before entry into the ARF. This will mark the beginning of Phase IV Transition to Operations. *R/V Taani*, the first ship in the Class, is currently scheduled to be delivered in Spring 2023 and will likely begin operations in Spring 2024. The project is planning a six-month stagger between vessel deliveries, with the projection that *R/V Narragansett Dawn* will enter the ARF in late 2024 and *R/V Gilbert R. Mason* will enter in early 2025.

In April 2021, Gulf Island Shipyards, the shipyard under contract with OSU for RCRV construction, was acquired by Bollinger Houma Shipyards (BHS). The contract was novated under the existing terms and conditions and assigned to BHS. Construction progress was improving as a result of the additional resources available under a larger shipyard, and BHS and OSU were concurrently replanning the project's schedule to account for more efficient processes as well as COVID-19 impacts. However, on August 29, 2021, Hurricane Ida made a direct hit on the city of Houma and on the shipyard. The shipyard survived relatively intact, with the main construction facility housing RCRV hulls one and two experiencing little damage. Two temporary warehouses erected to store RCRV components were destroyed by the storm; however, the materials stored in these areas are of a nature that they can withstand exposure to the elements for a limited time. The full extent of damages is still being evaluated, so the impact of Hurricane Ida on the RCRV project will likely not be known for several more months. Additional schedule delay is anticipated due to hurricane impacts. In FY 2022, \$25.0 million

Major Research Equipment and Facilities Construction

was appropriated for necessary expenses related to RCRV construction impacted by Hurricane Ida. Any additional funding required to address Hurricane Ida impacts will be specified in the FY 2024 Request.

Summary of COVID-19 Impacts

The realized impacts to the project cost, scope, and duration resulting from COVID-19 during 2020 include a delay in delivery of the first vessel, R/V *Taani*, and slightly lesser delays for the other two vessels. In October 2020, OSU estimated likely COVID-19-specific impacts through 2021 for the entire three-ship build of \$14.05 million and nine months. Depending on the additional realized impacts in FY 2022 and beyond, and the impact of Hurricane Ida, NSF will further adjust the TPC, as necessary.

Governance Structure and Partnerships

NSF Governance Structure

The RCRV project is overseen by the Division of Ocean Sciences (OCE) as part of the Ship Acquisition and Upgrade Program. OCE provides overall interdisciplinary science community guidance and oversight, while the administrative location of the RCRV project in the Integrative Programs Section promotes science facilities support expertise and coordination. Within NSF, RCRV project oversight is managed by a dedicated Program Officer with support from a secondary Program Officer who has experience with other OCE facilities. Cross-Foundation coordination is provided by an Integrated Project Team (IPT). The IPT includes staff from the Large Facilities Office, Cooperative Support Branch, Division of Institution and Award Support, Office of the Director, Office of the General Counsel, Office of the Assistant Director for Geosciences, and Office of Legislative and Public Affairs.

External Governance Structure

The RCRV project is funded through a series of agreements with OSU to manage the design refresh (conceptual, preliminary, and final designs), construction, testing and trials, and eventual operation of the first RCRV for the scientific community. The Principal Investigator for the award is the project manager (PM), who reports directly to the OSU Dean of the College of Earth, Ocean, and Atmospheric Sciences. The PM interacts directly with the NSF Program Officer and manages the RCRV administrative staff. The project scientist is a co-principal investigator for the award. The PM manages the RCRV project team including the risk manager, earned value management and schedule specialists, contracting officer, and OSU shipyard representative (SR). The SR in turn manages the naval architect and engineering contract and oversees the OSU shipyard staff and marine science technical advisors. The RCRV Science Oversight Committee (SOC), with regional representation, multidisciplinary expertise, and independent science representatives conducting research in mission areas supported by federal stakeholders (NSF, Office of Naval Research, and National Oceanic and Atmospheric Administration) will be active through all project phases. The SOC provides guidance to the OSU RCRV project team through the PM and/or the NSF Program Officer.

Partnerships and Other Funding Sources

NSF is the sole sponsor of RCRV construction to provide three ships for inclusion in the ARF. ARF vessels support the needs of all federal stakeholders who conduct oceanographic research, particularly NSF, the National Oceanic and Atmospheric Administration and the Office of Naval Research. Other users are granted access to ARF ships for research purposes, and all users pay the same daily rates. NSF is expected to support approximately 70 percent of RCRV utilization. NSF intends to make separate awards to each RCRV-operating institution.

Cost and Schedule

Total Funding Requirements for RCRV
(Dollars in Millions)

	Prior Years	FY 2021 Actual	FY 2021 ARP	FY 2022 ²	FY 2023 Request	ESTIMATES ³					
						FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	
R&RA:											
Development & Design	\$10.47	-	-	-	-	-	-	-	-	-	
Operations & Maintenance		-	-	-	-	4.90	12.93	15.10	15.60	16.10	
Subtotal, R&RA	\$10.47	-	-	-	-	\$4.90	\$12.93	\$15.10	\$15.60	\$16.10	
MREFC:											
Implementation ¹	353.97	-	14.05	30.00	1.98	-	-	-	-	-	
Subtotal, MREFC	\$353.97	-	\$14.05	\$30.00	\$1.98	-	-	-	-	-	
TOTAL REQUIREMENTS	\$364.44	-	\$14.05	\$30.00	\$1.98	\$4.90	\$12.93	\$15.10	\$15.60	\$16.10	

¹ Includes \$14.05 million of ARP funding carried forward into FY 2022.

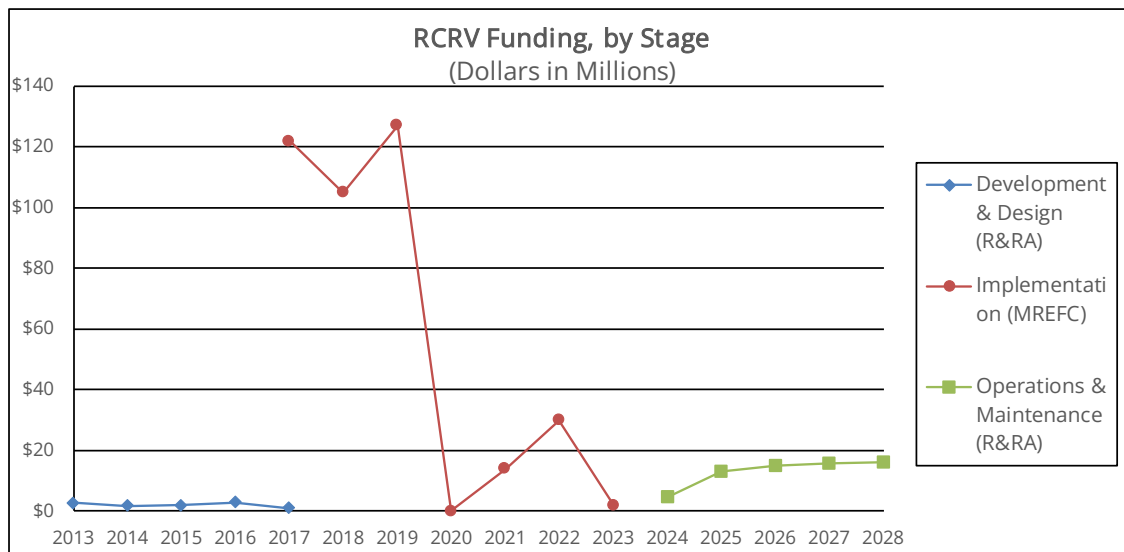
² The FY 2022 column includes \$5.0 million from the FY 2022 Request and \$25.0 million provided under H.R. 5305, the "Extending Government Funding and Delivering Emergency Assistance Act" for necessary expenses related to RCRV construction impacted by Hurricane Ida.

³ Outyear estimates are for planning purposes only.

Total R&RA funding from FY 2017 to FY 2019 for RCRV design was \$10.47 million. Total MREFC funding appropriated to support construction is currently \$353.97 million. An additional \$14.05 million in FY 2021 American Rescue Plan/MREFC funding was allocated to RCRV for COVID-19 impacts, which is planned for obligation in FY 2022.

An additional \$5.0 million in FY 2022 MREFC funding was requested for NSF-held management reserve due to known construction delays from COVID-19, which is an unforeseen event that cannot be covered by budget contingency, per NSF policy. The FY 2023 Request of \$1.98 million is the current estimated amount needed to address the remaining impacts due to COVID-19.

NSF received \$25.0 million in one-time funding for necessary expenses related to RCRV construction impacts from Hurricane Ida. As the full extent of damages is still being evaluated, no additional funds are requested to address Hurricane Ida impacts in FY 2023.



Future Operations Costs

Annual ship operations costs are well understood after several decades of experience with vessels of all classes in the U.S. Academic Research Fleet. OSU developed an estimate for the first year of operations assuming a robust but reasonable operating schedule of 200 days per year. OSU estimates each RCRV will cost \$7.0 million to operate in its first full year, resulting in a rate of approximately \$35,000 per day, including technician support. This is comparable to the operating cost of current vessels after applying the appropriate multipliers for size and complexity. The ultimate annual cost for operating three RCRVs will be partially offset by cost savings from vessel retirements elsewhere in the ARF.

Reviews

- **Proposal Review:** In 2012, NSF issued Solicitation 12-558, Construction of Regional Class Research Vessels, which resulted in the selection of OSU as the lead institution for construction and for operation of the first vessel.
- RCRV proceeded through the standard NSF processes that included a Conceptual Design Review (December 2013), Preliminary Design Review (August 2014) and Final Design Review (December 2016). The Final Design Review (FDR) ensured that anticipated project costs remained realistic and that no unforeseen events had arisen prior to the start of construction during FY 2017. The FDR Panel recommended that the project advance to the Construction Stage.
- **Annual Progress Review:** The first construction stage review was conducted in August 2018. Progress towards Design Verification and Transfer and OSU's management of the shipyard contract was evaluated. The review panel expressed confidence that the OSU Team was well qualified, had extensive relevant experience in ship acquisition, had established a positive, professional working relationship with Gulf Island Shipyards, and could deliver up to three RCRVs, within budget and on schedule, that would meet science mission requirements. Quarterly Management Reviews are conducted by OSU at the shipyard with NSF staff in attendance. The February 2020 Annual Construction Review was held at Gulf Island Shipyards, while the February 2021 review was held virtually due to the pandemic. The review panels expressed confidence that the OSU Project Team remains capable of delivering three RCRVs to the Academic Research Fleet despite the current challenges (See Risks below).

Risks

The following principal risks have been identified on OSU's project risk register. Planned mitigation strategies are included here with each identified risk.

- **Hull Delivery Delay:** BHS is replanning the construction schedule and indicated an anticipated nine-month delay to the delivery of the *R/V Taani* beyond the contractual date. This delay is expected to impact the deliveries of the *R/V Narragansett Dawn* and the *R/V Gilbert R. Mason*, although the overall delay to the project will likely be mitigated by refinements to the transition-to-operations strategy. The root cause of the delay is COVID-19 and the cost to the project will likely be mostly from additional project management expenses.
- **Transition to Operations:** Experience with commissioning new research vessels demonstrates the likelihood of unplanned events that could result in the need for additional port calls during sea trails and/or construction support if equipment fails. This risk will remain until the vessels are put to sea.
- **Requirements Changes:** All stakeholders, including the construction team, operating institutions,

Science Oversight Committee, and NSF can recommend requirements changes if improvements to operations or science support justify such changes. The ability to accommodate such recommendations is related to the availability of resources and an evaluation of the necessity for them.

- **Inadequate Shipyard Performance:** Shipyard's performance, including its subcontractors', will remain a risk throughout construction. Realization of this risk resulted in a pause in construction from January to August 2020, and the use of approximately \$18 million in contingency, which also mitigated future likelihood of occurrence. Additionally, construction progress is improving under the new, larger shipyard owner, BHS. The February 2022 Annual Progress Review panel remarked that BHS adds resources not previously available to the project, such as fabrication of the RCRV aluminum superstructure at another BHS facility.
- **Unanticipated Personnel Costs:** Personnel costs or required support may be greater than anticipated for operating institutions during construction and commissioning. This risk includes higher than anticipated crew costs, including training for RCRV level of tonnage, or necessary additional personnel. This risk does not include additional time that could be required for transition to operations.

Approximately \$34.0 million in contingency has been allocated to date as a result of realizing known risks. This amount decreased by \$890,000 from that reported in the FY 2022 Request due to funds having been returned to contingency, which occurred because actual costs for completed tasks were below their estimates. A science-prioritized and time-phased scope management plan is in place to minimize impacts to science capabilities in case contingency funds are insufficient to cover realized risks. Scope reductions are not being considered to mitigate cost impacts from the pandemic. Although statistical estimates of downtime due to weather could be included in the risk model, a direct hit from a hurricane is not a risk that can be estimated probabilistically by the project team, and thus is a risk held by NSF.