

## REGIONAL CLASS RESEARCH VESSELS (RCRV)

\$0

The RCRV Project is being constructed in a three-year funding profile within an NSB approved not-to-exceed total project cost of \$353.97 million. In FY 2017, P.L. 115-31 appropriated \$121.88 million to facilitate the planning and construction of three vessels. In FY 2018 P.L. 115-141 appropriated \$105.0 million to continue construction of three vessels. In FY 2019, P.L. 116-6 appropriated \$127.09 million, sufficient funding to complete construction of three vessels. This narrative provides a history and project status.

**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 Request	Total Project Cost
\$121.88	\$105.00	\$127.09	-	-	\$353.97

The 2015 National Academies of Sciences, Engineering, and Medicine (the National Academies) report, *Sea Change: 2015-2025 Decadal Survey of Ocean Sciences*,<sup>1</sup> described eight high-priority science questions that will be supported by RCRV 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?
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?

### Baseline History

The RCRV project is a major component in the plan for modernizing the U.S. Academic Research Fleet.<sup>2</sup> 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. Oregon State University (OSU) was selected and received the award in 2013. Input from external review panels,

<sup>1</sup> The National Academies. *Sea Change: 2015-2025 Decadal Survey of Ocean Sciences*, 2015. [www.nap.edu/read/21655/chapter/1](http://www.nap.edu/read/21655/chapter/1)

<sup>2</sup> National Ocean Council. *Federal Oceanographic Fleet Status Report*, 2013. [https://obamawhitehouse.archives.gov/sites/default/files/federal\\_oceanographic\\_fleet\\_status\\_report.pdf](https://obamawhitehouse.archives.gov/sites/default/files/federal_oceanographic_fleet_status_report.pdf)

Major Research Equipment and Facilities Construction

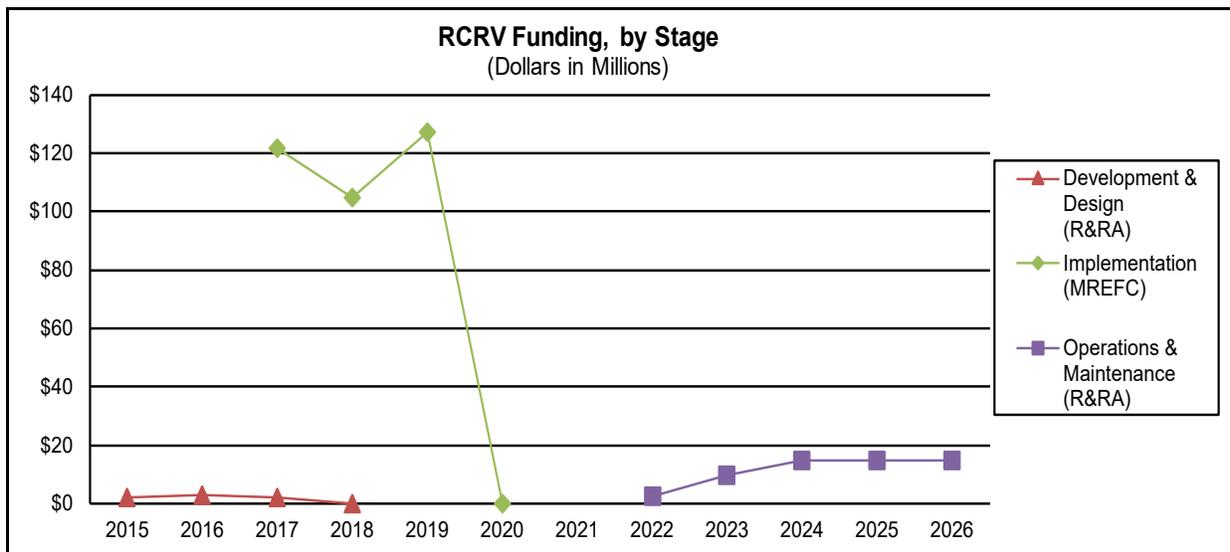
the University-National Oceanographic Laboratory System, and the National Academies *Sea Change* report, was received during the period 2013 to 2015 and informed the final decision to pursue construction. In 2015, the National Science Board authorized inclusion of funds to initiate construction for the 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 awarded a contract for construction to Gulf Island Shipyards, Houma, LA. NSF plans to fund the operations of the RCRVs within the overall projected budget for the ARF, leveraging savings from fleet rightsizing through the retirement of older and less capable vessels.

**Total Funding Requirements for RCRV**

(Dollars in Millions)

	Prior Years	FY 2019 Actual	FY 2020 Estimate	FY 2021 Request	ESTIMATES				
					FY 2022	FY 2023	FY 2024	FY 2025	FY 2026
<b>R&amp;RA:</b>									
Development & Design	\$11.39	-	-	-	-	-	-	-	-
Operations & Maintenance	-	-	-	-	2.45	9.80	14.70	14.70	14.70
<b>Subtotal, R&amp;RA</b>	<b>\$11.39</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>\$2.45</b>	<b>\$9.80</b>	<b>\$14.70</b>	<b>\$14.70</b>	<b>\$14.70</b>
<b>MREFC:</b>									
Implementation <sup>1</sup>	226.88	127.09	-	-	-	-	-	-	-
<b>Subtotal, MREFC</b>	<b>\$226.88</b>	<b>\$127.09</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>TOTAL REQUIREMENTS</b>	<b>\$238.27</b>	<b>\$127.09</b>	<b>-</b>	<b>-</b>	<b>\$2.45</b>	<b>\$9.80</b>	<b>\$14.70</b>	<b>\$14.70</b>	<b>\$14.70</b>

<sup>1</sup> Includes \$35.97 million carried forward into FY 2020.



**Management and Oversight**

- NSF 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 BFA Large Facilities Office, BFA Division of Acquisition and Cooperative Support, BFA 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 Structure:** The RCRV project is funded through a series of cooperative 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 on the award. The PM manages the core RCRV 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 stakeholder federal agencies (e.g., 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.

## **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 ship operations.
- 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 panel expressed confidence that the OSU Team is well qualified, has extensive relevant experience in ship acquisition, has established a positive, professional working relationship with Gulf Island Shipyards, and is entirely capable of delivering up to three RCRVs, within budget and on schedule, that will meet mission requirements. Quarterly Management Reviews are conducted at the shipyard. An Annual Project Review with an External Panel is planned for February 2020 at Gulf Island Shipyards.

## **Project Status**

OSU is managing the construction 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 (Years one to three)
- Phase II: Shipyard Selection (Year four)
- Phase III: Construction (Years five through eight)
- Phase IV: Transition to Operations (Years eight and nine)

The project completed Phase II in CY 2017, during which bids for construction of RCRV were solicited and evaluated from U.S. shipyards.

The project is now in Phase III construction. Keel-laying for the first RCRV, named R/V *Taani*, was completed in November 2018 and for the second RCRV, named R/V *Resolution*, in May 2019. A keel-laying for the third RCRV, named R/V *Gilbert R. Mason*, is planned for Spring 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 safely and efficiently conduct science operations before entry into the U.S. Academic Research Fleet. 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 Fall 2021 and will likely begin operations in mid-late 2022. The project is planning a six-month stagger between vessel deliveries, with the projection that R/V *Resolution* will enter the ARF in early 2023 and R/V *Gilbert R. Mason* will enter in mid-late 2023.

### **Cost and Schedule**

The length of the project is projected to be nine years, including nine months of schedule contingency. Funding for the construction of RCRV from FY 2017 through FY 2019 supports the shipyard contract structure.

Total estimated funding to OSU for RCRV through FY 2020 is \$11.39 million in R&RA funds for development and design and \$328.0 million in MREFC funds for construction.

A standard NSF oversight practice is to hold a portion of budget contingency and only allocating to the program, for obligation to the project, based on demonstrated need. This oversight mechanism will generally result in some MREFC carry over each year; however, future obligation is anticipated to manage project risks. An additional \$25.97 million in MREFC funding is held by NSF for contingency.

### **Risks**

Technical: The following technical risks are among the principal risks identified on OSU's project risk register. Planned mitigation strategies are included here with each identified risk. (1) Various situations may occur that could delay or add cost to OSU's management portion of the project. These include delayed appointments of key personnel, contracting issues, lack of management capacity due to optimistic planning, or misunderstanding of requirements. Contingency funds are included to increase OSU management capacity if needed. (2) Sonar sensors, science load handling systems, and other vessel sub-systems may not perform as required. Contingency funds are included to ensure performance capabilities are met, given that many warranties are not likely to be performance-based or are otherwise limited contractually with the shipyard. (3) Growth in weight and vertical center of gravity has required design changes, namely lengthening by six feet, to ensure vessel seaworthiness. This is a typical risk for ship construction (and research vessels in particular) that requires active management by OSU and the shipyard, as well as oversight by NSF, such that the ship can operate safely and effectively. This risk is reduced by the re-design but will not be entirely eliminated until the as-built ship is evaluated. Approximately \$21.96 million in contingency has been allocated to-date as a result of realizing known risks.

A science-prioritized, time-phased de-scoping plan is in place (per NSF Large Facilities Manual, NSF17-066) to minimize impacts to science capabilities in case contingency funds are insufficient to cover realized risks.

## **Future Operations Costs**

Annual ship operations costs are well understood after several decades of experience with vessels of all types in the U.S. Academic Research Fleet. OSU included an estimate for the first year of operations beginning in 2022 using reasonable assumptions for escalations through 2021. They also assumed 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 operation of current similar vessels after applying the appropriate cost escalation factors for size and complexity. NSF supports approximately 70 percent of the use of the U.S. Academic Research Fleet, which suggests RCRV is likely to cost NSF approximately \$2.45 million in FY 2022 for six months of operations of the R/V *Taani*. The ultimate annual cost of approximately \$14.70 million for operating three RCRVs will be balanced by cost savings from reducing scope elsewhere in the U.S. Academic Research Fleet. Solicitations for operations of additional vessels beyond the first RCRV (R/V *Taani*) operated by OSU were released in January 2018 and July 2019. The East Coast Oceanographic Consortium, whose members include the University of Rhode Island, the Woods Hole Oceanographic Institution, and the University of New Hampshire School of Marine Science and Ocean Engineering, along with 13 associate members, was selected to operate the second RCRV (R/V *Resolution*). The Gulf-Caribbean Oceanographic Consortium, whose members include the University of Southern Mississippi, the Louisiana University Marine Consortium, and 15 associate members, was selected to operate the third RCRV (R/V *Gilbert R. Mason*).