

Audit of Industry-University Cooperative Research Center: Center for Space, High- performance, and Resilient Computing — Virginia Tech





At a Glance

Audit of Industry-University Cooperative Research Center: Center for Space, High-performance, and Resilient Computing — Virginia Tech
OIG 24-1-009 | March 12, 2024

WHY WE DID THIS AUDIT

NSF created the Industry-University Cooperative Research Center (IUCRC) program in 1973 to foster long-term partnerships among academia, industry, and government. The IUCRC program provides a structure for academic researchers to conduct fundamental, pre-competitive research of shared interest to industry and government organizations. The Center for Space, High-performance, and Resilient Computing (SHREC) is one of NSF's more than 80 centers in the IUCRC program. SHREC assists industrial partners, government agencies, and research organizations in mission-critical computing research.

We conducted an audit of NSF's SHREC award to Virginia Polytechnic Institute and State University (Virginia Tech) to determine if Virginia Tech mitigated potential conflicts of interest; properly managed and accounted for program income; and claimed costs that were allowable, allocable, reasonable, and in conformity with NSF award terms and conditions and applicable federal requirements.

WHAT WE FOUND

Virginia Tech generally complied with SHREC award requirements. It properly tracked and reported its SHREC receipts and expenditures of program income. Virginia Tech's claimed costs and expenditures of program income were allowable, allocable, reasonable, and in conformity with NSF award terms and conditions and applicable federal requirements. Additionally, Virginia Tech had a policy on conflicts of interest that met all the award requirements and followed that policy for the SHREC award. However, Virginia Tech could improve its controls to ensure it submits documents to NSF necessary to support annual membership certifications.

WHAT WE RECOMMEND

We recommend that NSF direct Virginia Tech to improve its documentation of annual membership certifications.

AGENCY RESPONSE

Virginia Tech agreed with the recommendation to strengthen its controls over submitting documents necessary to support annual membership certifications. We included Virginia Tech's response to this report, in its entirety, in Appendix C.

CONTACT US

For congressional, media, and general inquiries, email OIGPublicAffairs@nsf.gov.



NATIONAL SCIENCE FOUNDATION
Office of Inspector General

MEMORANDUM

DATE: March 12, 2024

TO: Quadira Dantro
Director
Division of Institution and Award Support

Jamie French
Director
Division of Grants and Agreements

FROM: Theresa S. Hull [REDACTED]
Assistant Inspector General for Audits

SUBJECT: Final Report No. 24-1-009, *Audit of Industry-University Cooperative Research Center: Center for Space, High-performance, and Resilient Computing — Virginia Tech*

Attached is the final report on the subject audit. We have included Virginia Tech's response to the report as an appendix.

Please coordinate with our office during the 6-month resolution period, as specified by OMB Circular A-50, to develop a mutually agreeable resolution of the audit finding. The recommendation should not be closed until NSF determines that the recommendation has been adequately addressed and the proposed corrective actions have been satisfactorily implemented.

We appreciate the courtesies and assistance NSF staff provided during the audit. If you have any questions, please contact Kelly Stefanko, Audit Manager, at 703-292-7100 or OIGPublicAffairs@nsf.gov.

CC: Christina Sarris, Behrooz Alex Shirazi, Prakash Balan, Rochelle Ray, Charlotte Grant-Cobb

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Abbreviations

IAB	Industry Advisory Board
IUCRC	Industry-University Cooperative Research Center
OSP	Office of Sponsored Programs
PAPPG	<i>Proposal & Award Policies & Procedures Guide</i>
SHREC	Center for Space, High-performance, and Resilient Computing
Virginia Tech	Virginia Polytechnic Institute and State University

Background

The National Science Foundation is an independent federal agency created by Congress in 1950 “[t]o promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes” (Pub. L. No. 81-507). With a budget of about \$9.9 billion (FY 2023), NSF is the funding source for about 25 percent of all federally supported basic research conducted by America’s colleges and universities. Each year, NSF supports about 318,000 scientists, engineers, educators, and students at universities, laboratories, and field sites.

Industry-University Cooperative Research Center (IUCRC) Program

NSF created the Industry-University Cooperative Research Center (IUCRC) program in 1973 to foster long-term partnerships among academia, industry, and government. These partnerships support research programs of mutual interest, contribute to the nation's research infrastructure base, promote workforce development, and facilitate technology transfer. In its fiscal year 2024 budget request to Congress, NSF requested nearly \$22 million to fund the IUCRC program.

The IUCRC program provides a structure for academic researchers to conduct fundamental, pre-competitive research of shared interest to industry and government organizations. Universities identify a research topic of interest to industry and apply for support from NSF. If approved, the university uses NSF funds¹ to plan and operate a new IUCRC, or Center, or to join an existing Center. Industry members, such as large and small businesses, startups, non-profit organizations, and government agencies, pay membership fees to support the Center’s research costs and activities. NSF provides funding for administrative costs and a governance framework to manage membership, operations, and evaluation.

New IUCRCs typically start with a planning award and proceed to a Phase I award that lasts 5 years. At the time of the award under audit, IUCRC awardees could request support for two subsequent 5-year awards (Phase II and Phase III).² IUCRCs are expected to grow and be independently sustainable by the end of NSF support.

According to the IUCRC Program Solicitation,³ membership fees received by the center are considered program income. Awardees must use at least 90 percent of the IUCRC program

¹ Throughout this report, we referred to NSF funds as award transactions, direct award costs, or costs claimed on the award.

² NSF 20-570, *Industry-University Cooperative Research Centers Program (IUCRC) Program Solicitation*, dated May 7, 2020, moved IUCRC to a two-phase model, and replaced NSF 17-516, dated November 7, 2016.

³ NSF 17-516, dated November 7, 2016. The program solicitation specifies additional award conditions and reporting requirements and is incorporated by reference into the award.

income to support direct costs of the research and may use up to 10 percent to support indirect costs.⁴

Center for Space, High-performance, and Resilient Computing Award to Virginia Tech

The Center for Space, High-performance, and Resilient Computing (SHREC) is one of NSF's more than 80 active IUCRCs. Launched in 2018, SHREC assists industrial partners, government agencies, and research organizations in mission-critical computing research in the following areas:

- space computing for earth science, space science, and defense;
- high-performance computing for a broad range of applications; and
- resilient computing for dependability in harsh or critical environments.

Virginia Polytechnic Institute and State University (Virginia Tech) joined SHREC in 2019 as the Center's fourth site. At the time of our audit, the award was in the fifth year of its Phase I award. In addition to SHREC, at the time of our audit, Virginia Tech was part of at least six other IUCRCs.

At Virginia Tech, the Office of Sponsored Programs (OSP) is the steward of the university's research portfolio and is responsible for ensuring that all research proposals and projects comply with university, federal, and sponsor regulations, policies, and procedures.

Audit Objectives

The objectives of this audit were to determine if Virginia Tech mitigated potential conflicts of interest; properly managed and accounted for program income; and claimed costs on awards that were allowable, allocable, reasonable, and in accordance with NSF award terms and conditions and applicable federal requirements. Please see Appendix A for more information about our objectives, scope, and methodology.

Results of Audit

Virginia Tech generally complied with SHREC award requirements. It properly tracked and reported its SHREC receipts and expenditures of program income. Virginia Tech's claimed costs and expenditures of program income were allowable, allocable, reasonable, and in accordance with NSF award terms and conditions and applicable federal requirements. Additionally, Virginia Tech had a policy on conflicts of interest that met all the award requirements and

⁴ Per 2 CFR§. 200.1, "Indirect (facilities & administrative (F&A)) costs means those costs incurred for a common or joint purpose benefitting more than one cost objective, and not readily assignable to the cost objectives specifically benefitted, without effort disproportionate to the results achieved."

followed that policy for the SHREC award. However, Virginia Tech could improve its controls to ensure it submits documents to NSF necessary to support annual membership certifications.

Virginia Tech Generally Met SHREC Award Requirements

Virginia Tech met SHREC award requirements for tracking program income and expenditures; claiming costs that were allowable, allocable, and reasonable; and complying with conflict of interest requirements.

Virginia Tech Tracked Program Income and Expenditures

We found that Virginia Tech complied with award requirements for tracking and reporting the amounts of program income received and expended. It created a unique fund for each SHREC-sponsored project by year and fully accounted for all the membership fees it received. Virginia Tech's OSP annually identified program income earned and the amount expended in a Program Income Reporting Worksheet to NSF's Division of Financial Management. Virginia Tech also annually certified IUCRC membership and the amount of program income received from each member as required by the award solicitation. Finally, we determined Virginia Tech's total applied indirect costs were roughly 5 percent of the total program income, confirming it complied with the requirement to use at least 90 percent of the program income to support direct costs of the research.

Costs Claimed in Our Sample Were Allowable, Allocable, and Reasonable

We found that costs reported in our judgmentally selected samples of 6 award transactions and 12 program income transactions were allowable, allocable, reasonable,⁵ and in accordance with NSF and federal requirements.

Specifically, Virginia Tech primarily used its award to pay the principal investigator and other faculty and administrative salary and wages and related fringe benefits. We tested a judgmentally selected sample of 6 award transactions totaling \$21,653. This included the largest salary transactions for the two highest paid faculty on the award. We also selected the largest travel and training transactions. Virginia Tech provided employment verification supporting the rate of pay and effort certifications supporting the time individuals in our sample worked on SHREC-related projects. For the travel and training, Virginia Tech provided related invoices and conference agendas.

⁵ For definitions of allowability, allocability, and reasonableness, please see Appendix B.

In addition, Virginia Tech primarily used program income to pay graduate students' salaries and tuition remission. We tested a judgmentally selected sample of 12 program income transactions totaling \$51,062. This included the largest dollar transactions from several different projects, including the largest funded projects. For coverage of a variety of transaction types, we also tested two travel transactions. Virginia Tech provided documentation supporting the amount of salary and tuition it paid and activity reports showing the students were assigned to a SHREC project for time charged. For the travel, Virginia Tech provided receipts, invoices, and conference agendas with links to the SHREC-related papers presented.

Virginia Tech Complied with Conflict of Interest Requirements

NSF's *Proposal & Award Policies & Procedures Guide* (PAPPG),⁶ which is incorporated by reference into the award, requires each grantee organization employing more than 50 persons to maintain an appropriate written and enforced policy on conflicts of interest and that the organization manage, reduce, or eliminate any conflicts of interest prior to the expenditure of award funds. Among other things, the organizational policy should require that each investigator disclose all significant financial interests that would be affected by the research or activities funded or proposed for funding by NSF.

Virginia Tech's conflict of interest policy covered all NSF requirements and required investigators to disclose financial interests related to Virginia Tech operations and complete conflict of interest training before engaging in sponsored research. We tested Virginia Tech's compliance with its conflict of interest policy and found applicable staff met the training and financial disclosure requirements. There were no conflicts disclosed, so no mitigation was required.

Virginia Tech Could Improve Controls for Submitting Documents Necessary to Support Membership Requirements

NSF's IUCRC program solicitation⁷ requires a Phase I site of a multi-site center to annually retain three distinct members, totaling \$150,000 or more in membership fees. If a center does not meet membership requirements, the NSF solicitation states that NSF may withhold continuing grant increments and adjust the award end date if it happens twice within any award period.

In its third year of the SHREC award, Virginia Tech's annual SHREC membership certification listed two entities as members. When we asked Virginia Tech why the annual certification only

⁶ The PAPPG, in conjunction with the applicable standard award conditions incorporated by reference in the award, serve as NSF's implementation of 2 CFR Part 200, *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards*.

⁷ NSF 17-156

listed two entities, it responded that there were three members because one of the member organizations had two distinct memberships.

The program solicitation allows organizations that are part of a divisionally structured or decentralized corporation, company, or federal agency to count as distinct individual members. However, if the awardee intends to count such entities as individual members, it must provide NSF supporting evidence as part of its annual membership certification. Virginia Tech's OSP stated it was not aware of this requirement and did not provide NSF the required supporting evidence to confirm distinct membership.

In addition, the program solicitation requires a signed membership agreement for each member and provides a template directing specific language to be included. The SHREC membership agreements, which were based upon the provided template and signed on behalf of Virginia Tech by the Director of OSP, state, "[T]he company should join the center with the intention of remaining a fee-paying member for at least two years. However, the company may terminate this agreement by giving the university 90 days written notice prior to the termination date." On two occasions, SHREC industry members chose not to continue beyond their first year but did not provide the 90 days written notice of their intention to terminate membership as required. Because Virginia Tech's annual number of members remained at or near the minimum, it was important for Virginia Tech to know if any members planned to leave SHREC. Monitoring the membership agreement requirements and ensuring members provide termination notification could help Virginia Tech recognize potential problems in meeting the minimum membership requirements and the need to recruit new members.

Recommendation

We recommend that the NSF Director of the Division of Institution and Award Support:

1. Direct Virginia Tech to strengthen its controls over submitting documents necessary to support annual membership certifications.

OIG Evaluation of Agency Response

Virginia Tech agreed with our one recommendation and has agreed to take responsive actions. Specifically, the Office of Sponsored Program will clearly list members in their annual certification, provide NSF the required supporting evidence to confirm distinct memberships, and educate principal investigators to obtain written notice from IUCRC members who end their membership. We have included Virginia Tech's response to this report in its entirety in Appendix C.

Appendix A: Objectives, Scope, and Methodology

Objectives

The objectives of this audit were to determine if Virginia Tech mitigated potential conflicts of interest; properly managed and accounted for program income; and claimed costs on awards that were allowable, allocable, reasonable, and in conformity with NSF award terms and conditions and applicable federal requirements.

Scope and Methodology

We conducted this audit between March 2023 and February 2024 in accordance with *Generally Accepted Government Auditing Standards*. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions, based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions.

To accomplish our objectives, we selected Virginia Tech's IUCRC SHREC award for review. Specifically, we analyzed the requirements in NSF's IUCRC program solicitation NSF 17-516, grant general conditions, research terms and conditions, 2 CFR Part 200, and PAPPG applicable to the award. We tested compliance with these requirements, including Virginia Tech's conflict of interest policies. We interviewed the award's principal investigator and OSP staff.

We tested judgmentally selected samples of some of Virginia Tech's largest, and most frequent, direct award and program income expenditures reported for the SHREC award to determine if costs claimed by Virginia Tech were allowable, allocable, reasonable, and in conformity with NSF award terms and conditions and applicable federal requirements. Specifically, as of April 18, 2023, Virginia Tech claimed to have expended \$198,365 of its SHREC award. We judgmentally selected a sample of 6 transactions based on amount and account description totaling \$21,653 to test. In addition, as of April 18, 2023, Virginia Tech claimed to have expended \$766,126 in program income. We judgmentally selected a sample of 12 transactions based on amount and account description totaling \$51,062 to test. We tested Virginia Tech's compliance with its conflict of interest policy for applicable staff on the SHREC award.

We also obtained computer-processed data from Virginia Tech during our audit. Virginia Tech provided detailed transaction data for costs charged to the NSF award. We assessed the reliability of data by (1) interviewing Virginia Tech staff knowledgeable about the data, (2) reviewing information about the data and the system that produced them, and (3) performing reconciliations and testing of various data elements.

Internal Control Assessment

In assessing the allowability of Virginia Tech costs claimed, we gained an understanding of the internal control structure applicable to the scope of this audit through interviewing Virginia

Tech staff, reviewing policies and procedures, reviewing transactions and accounting system documentation, and conducting transaction testing. We assessed the five components of internal control: control environment, risk assessment, information and communication, monitoring activities, and existing control activities.

Appendix B: Definitions of Allocable, Allowable, and Reasonable Costs

Allocable Cost: According to 2 CFR § 200.405, a cost is allocable to a particular federal award or other cost objective if the goods or services involved are chargeable or assignable to that federal award or cost objective in accordance with relative benefits received. This standard is met if the cost:

- (a) Is incurred specifically for the federal award.
- (b) Benefits both the federal award and other work of the non-federal entity and can be distributed in proportions that may be approximated using reasonable methods.
- (c) Is necessary to the overall operation of the non-federal entity and is assignable in part to the federal award in accordance with the principles in this subpart.

Allowable Cost: According to 2 CFR § 200.403, except where otherwise authorized by statute, costs must meet general criteria in order to be allowable under federal awards, including the following three criteria:

- (a) Be necessary and reasonable for the performance of the federal award and be allocable thereto under these principles.
- (b) Conform to any limitations or exclusions set forth in these principles or in the federal award as to types or amount of cost items.
- (c) Be consistent with policies and procedures that apply uniformly to both federally-financed and other activities of the non-federal entity.

Reasonable Cost: According to 2 CFR § 200.404, a reasonable cost is a cost that, in its nature and amount, does not exceed that which would have been incurred by a prudent person under the circumstances prevailing at the time the decision to incur the cost was made.

Appendix C: Recipient Response



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Theresa S. Hull
National Science Foundation
Assistant Inspector General for Audits

Subject: Audit of Industry-University Cooperative Research Center: Center for Space, High-performance, and Resilient Computing — Virginia Tech

Reference: OIG 8-306-21-021-N, Cooperative Agreement No: 72030618LA00002.

Dear Miss Hull,

Please accept the following management response for the finding/recommendation.

Virginia Tech could improve controls for submitting documents necessary to support membership requirements:

- a. In Virginia Tech's annual SHERC membership certification, The Office of Sponsored Programs will clearly list the members in the IUCRC program and also the distinct memberships held by each of the members. For instance, if one member has multiple memberships, we will list them separately to ensure that we annually retain at least three distinct members as required by NSF's IUCRC program solicitation. We will provide NSF the required supporting evidence to confirm distinct memberships.
- b. The Office of sponsored Programs will educate the Principle investigators that if any member chooses not to continue the IUCRC membership after first year, a written notice must be provided by the members to Virginia Tech 90 days prior to the termination date. This way the university may recognize potential issues and may recruit new member to the IUCRC program if required to maintain the minimum members. OSP will maintain the termination documentation for their records.

If you have any questions regarding Virginia Tech's management response, please contact Divya Amin, Office of Sponsored Programs, Director for Financial Compliance and Integrity at amind@vt.edu or 540-231-0950.

National Defense Authorization Act

General Notification

Pursuant to Pub. L. No. 117-263 § 5274, business entities and non-governmental organizations specifically identified in this report have 30 days from the date of report publication to review this report and submit a written response to NSF OIG that clarifies or provides additional context for each instance within the report in which the business entity or non-governmental organizations is specifically identified. Responses that conform to the requirements set forth in the statute will be attached to the final, published report.

If you find your business entity or non-governmental organization was specifically identified in this report and wish to submit comments under the above-referenced statute, please send your response within 30 days of the publication date of this report to OIGPL117-263@nsf.gov, no later than April 14, 2024. We request that comments be in .pdf format, be free from any proprietary or otherwise sensitive information, and not exceed two pages. Please note, a response that does not satisfy the purpose set forth by the statute will not be attached to the final report.

About Us

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Contact Us

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