Management Challenges for the National Science Foundation in Fiscal Year 2021

NATIONAL SCIENCE FOUNDATION
OFFICE OF INSPECTOR GENERAL

October 15, 2020

AT A GLANCE

Management Challenges for the National Science Foundation in Fiscal Year 2021

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WHY WE DID THIS REPORT

The *Reports Consolidation Act of 2000* (Pub. L. No. 106-531) requires us to annually update our assessment of NSF's "most serious management and performance challenges facing the agency … and the agency's progress in addressing those challenges."

WHAT WE FOUND

NSF leads the world as an innovative agency dedicated to advancing science. Its support of basic research has led to many discoveries that have contributed to the progress of science, as well as the national health, prosperity, and welfare. Beyond its scientific mission, NSF must be a responsible steward of taxpayer dollars.

This year, we have identified six areas representing challenges NSF must continue to address to enhance mission performance:

- Providing Oversight of Major Multi-User Research Facilities
- Providing Oversight of Grants During a Pandemic
- Managing the Intergovernmental Personnel Act Program
- Providing Oversight of the Antarctic Infrastructure Modernization for Science (AIMS) Project
- Increasing Diversity in Science & Engineering Education and Employment
- Mitigating Threats Posed by Foreign Government Talent Recruitment Programs

We have included information about challenges NSF faces in addressing the public health and economic crises resulting from the Coronavirus Disease 2019 (COVID-19) pandemic within each challenge section. We have also removed two challenges identified in our FY 2020 Management Challenges report — Meeting Digital Accountability and Transparency Act of 2014 (DATA Act) Reporting Requirements and Encouraging the Responsible and Ethical Conduct of Research — based on NSF's significant progress in these areas.

We are encouraged by NSF's progress in its efforts to address critical management and performance challenges. Effective responses to these challenges will continue to promote the integrity of NSF-funded projects, help ensure research funds are spent effectively and efficiently, and help maintain the highest level of accountability over taxpayer dollars.

AGENCY RESPONSE TO *MANAGEMENT CHALLENGES FOR FISCAL YEAR 2020*

Following the issuance of this report, NSF will include its Management Challenges Progress Report and its response to *Management Challenges for the National Science Foundation in Fiscal Year 2020* in its Agency Financial Report.

FOR FURTHER INFORMATION, CONTACT US AT OIGPUBLICAFFAIRS@NSF.GOV.

National Science Foundation • Office of Inspector General
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MEMORANDUM

DATE: October 15, 2020

TO: Dr. Ellen Ochoa
Chair
National Science Board

Dr. Sethuraman Panchanathan
Director
National Science Foundation

FROM: Allison C. Lerner Allison C. Lerner
Inspector General
National Science Foundation

SUBJECT: Management Challenges for the National Science Foundation in Fiscal Year 2021

Attached for your information is our report, *Management Challenges for the National Science Foundation in Fiscal Year 2021*. The *Reports Consolidation Act of 2000* (Pub. L. No. 106-531) requires us to annually update our assessment of NSF's "most serious management and performance challenges facing the agency … and the agency's progress in addressing those challenges." A summary of the report will be included in the National Science Foundation Agency Financial Report.

If you have questions, please contact me at 703.292.7100.

Attachment

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Introduction

NSF leads the world as an innovative agency dedicated to advancing science. Its support of basic research has led to many discoveries that have contributed to the progress of science, as well as the national health, prosperity, and welfare. Beyond its scientific mission, NSF must be a responsible steward of taxpayer dollars.

The *Reports Consolidation Act of 2000* requires us to annually update our assessment of NSF's "most serious management and performance challenges facing the agency … and the agency's progress in addressing those challenges" (Pub. L. No. 106-531). Accordingly, we identify the challenges we consider most critical based on our audit and investigative work; general knowledge of the agency's operations; and evaluative reports of others, including the U.S. Government Accountability Office (GAO) and NSF's various advisory committees, contractors, and staff. We identify management challenges as those that meet at least one of the following criteria:

- The issue involves an operation that is critical to an NSF core mission.[1]
- There is a risk of fraud, waste, or abuse of NSF or other Government assets.
- The issue involves strategic alliances with other agencies, the Office of Management and Budget (OMB), the Administration, Congress, or the public.
- The issue is related to key initiatives of the President.
- The issue involves a legal or regulatory requirement not being met.

FY 2021 Challenges

This year, we have identified six areas representing the most serious management and performance challenges for NSF:

- Providing Oversight of Major Multi-User Research Facilities
- Providing Oversight of Grants During a Pandemic
- Managing the Intergovernmental Personnel Act Program
- Providing Oversight of the Antarctic Infrastructure Modernization for Science (AIMS) Project
- Increasing Diversity in Science & Engineering Education and Employment
- Mitigating Threats Posed by Foreign Government Talent Recruitment Programs

We describe our work and NSF's progress in addressing these six critical challenges areas in more detail in the following pages.

We have added a new challenge, Providing Oversight of Grants During a Pandemic, as well as included information within each section, to discuss challenges NSF faces in addressing the public health and economic crises resulting from the Coronavirus Disease 2019 (COVID-19) pandemic. NSF has procedures and plans in place to effectively manage the programs funded by the *Coronavirus Aid, Relief, and Economic Security Act* (CARES Act) and other related legislation. Its greater risks may be from the pandemic's impacts on institutions of higher education and other recipient organizations, which may extend to non-pandemic funding.

[1] The *National Science Foundation Act of 1950* (Pub. L. No. 81-507) sets forth the mission: "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes."

In addition, we have included another new challenge, Increasing Diversity in Science & Engineering Education and Employment, also impacted by COVID-19. NSF's ongoing efforts to address this challenge may help mitigate the pandemic's impact on Science, Technology, Engineering, and Mathematics (STEM) research and education, including reported adverse impacts for Hispanic and Black STEM undergraduates and women STEM faculty and students.

The Foundation has already begun to identify risk areas, develop mitigation strategies, and determine financial impacts of the pandemic. We are monitoring NSF's efforts to ensure that its strategies for mitigating impacts are fully developed and address the areas of greatest concern.

Progress in Addressing FY 2020 Challenges

We have removed two challenge areas identified in our FY 2020 Management Challenges report — Meeting Digital Accountability and Transparency Act of 2014 (DATA Act) Reporting Requirements and Encouraging the Responsible and Ethical Conduct of Research. NSF continues to improve its DATA Act reporting and work closely with OMB, the U.S. Department of the Treasury, and intra-Governmental groups. In addition, we are encouraged by NSF's actions to strengthen training in the responsible conduct of research at NSF-funded institutions and its commitment to ensuring the research enterprise it supports is free of harassment. NSF has also continued to emphasize its culture of zero tolerance for harassment of any kind by NSF staff.

In last year's report, we identified a new area — managing the enterprise-wide internal control environment — that we considered an emerging challenge for NSF. NSF continues to make progress in this area, refining and strengthening its overall internal control environment and integrating Enterprise Risk Management into its planning and operations. NSF's quick response to the pandemic and handling of additional CARES Act funding demonstrate an ability to adapt quickly and implement enterprise-wide solutions. We will continue to monitor NSF's progress in this area.

NSF's effective responses to its serious management and performance challenges will continue to promote the integrity of NSF-funded projects, help ensure research funds are spent effectively and efficiently, and help maintain the highest level of accountability over taxpayer dollars.

CHALLENGE 1 Providing Oversight of Major Multi-User Research Facilities

Why is this a serious management challenge?

This challenge involves an operation that is critical to an NSF core mission.

As part of its mission, NSF funds the scientific community to manage the development, design, construction, and operation of major multi-user research facilities (major facilities), which are state-of-the art infrastructure for research and education that include telescopes, ships, distributed networks, and observatories. NSF's major facility portfolio is inherently risky because the facilities are technically complex, and their construction and operating costs are high. In FY 2019, NSF spent approximately $285 million constructing major facilities and more than $1 billion operating them.

Major facilities have always faced unknown risks — for example, a snapped cable recently damaged a radio telescope's antennae at one facility — but the advent of COVID-19 has added an unprecedented degree of complexity and uncertainty for their operations. Facility closures and safety precautions taken due to COVID-19 have delayed construction and research, as well as increased costs. This has resulted in NSF authorizing total project costs increases and the reprogramming of funds to cover these increases. In response to COVID-19, many existing facilities have been closed or required to operate with minimal staff. This has led to disruptions in data gathering and routine maintenance, as well as the postponement or cancellation of some planned scientific activities. The pandemic response has also halted or delayed the construction of new facilities.

NSF continues to work diligently to address recommendations from recent audits. For example, to improve its oversight of federally owned property, including vehicles, NSF has developed standard operating guidance via an agency-wide equipment working group. NSF also has revised its standard solicitation language to ensure facility operation proposals include risks and inflation factors.

NSF's major facilities program has continued to evolve and improve each year, cementing its place as a model program. Its work to identify risk areas, develop mitigation strategies, and assess financial impacts of COVID-19 will help position it to best address this challenge.

Completed Actions

- ☑ Required recipients to develop segregation of funding plans for projects, including the Daniel K. Inouye Solar Telescope, Vera C. Rubin Observatory, and AIMS.
- ☑ Revised standard solicitation language to ensure facility operation proposals include risks and inflation factors.
- ☑ Implemented policies and procedures to improve pass-through entities' oversight of subrecipients.
- ☑ Developed standard operating guidance for oversight of federally owned property.
- ☑ Issued *Obligation and Allocation of Management Reserve* standard operating guidance, which eliminates the $10 million applicability limit for use on construction projects impacted by the pandemic.

Ongoing Actions

- ➢ Issuing the revised *Business System Review Guide*, which now aligns with *Uniform Guidance*.
- ➢ Finalizing the *Major Facilities Oversight Reviews* standard operating guidance.
- ➢ Completing major facilities portfolio workforce gap analysis.

CHALLENGE 2 Providing Oversight of Grants During a Pandemic

Why is this a serious management challenge?

This challenge involves an operation that is critical to an NSF core mission. There is also risk of fraud, waste, or abuse of NSF or other Government assets.

Making grants in support of promising scientific research is NSF's primary business and a key element of its mission. COVID-19 has added complexity to the grant management process due to the need to expend additional Federal funds to address its impacts, as well as the health, economic, and societal impacts on NSF's recipient environment.

The CARES Act, enacted on March 27, 2020, provided NSF with a total of $76 million, including $75 million to support its ongoing grant response to COVID-19 and $1 million to assist in the administration of those grants. These funds include Rapid Response Research (RAPID) awards and are in addition to NSF's existing active grant portfolio, which totaled more than $33 billion in FY 2019. As we reported in May 2020, we found NSF's CARES Act Spending Plan to be reasonable, prudent, and consistent with the intent of the Act's funding objectives. NSF is using existing funding mechanisms with established policies, procedures, and controls to disperse the funds provided by the CARES Act, which reduces the risk of misuse and helps ensure accountability.

However, COVID-19 has introduced new and unique factors to which NSF must adapt to maintain effective grant accountability. For example, OMB issued multiple guidance documents authorizing temporary spending flexibilities that greatly expanded the allowable uses of grant funds. Accordingly, while some scientific activity moved to a virtual environment, other activities slowed due to facility closures and stay-at-home orders. This has created uncertainty about achieving grant objectives, especially those reliant upon field research, continuous use of cell lines, animal colonies, or human subject participation. In some cases, restarting research may be costly and original grant objectives may be unattainable. Some institutions may no longer be viable due to pandemic-driven fiscal constraints, including the need to refund portions of tuition; lower than anticipated tuition revenue; and declining support from state governments, endowments, or other sources of funding. If those factors lead to staff cuts in sponsored research offices or offices responsible for identifying and managing scientists' conflicts of interest and commitment, recipients' ability to ensure compliance with NSF award terms and conditions could be undermined.

NSF has begun planning how to address some of these risks, but uncertainty remains, especially as the pandemic continues. NSF may need to make difficult decisions about which grants to terminate, which to continue supporting at established funding levels, and which to support with supplemental funding — and it must consider how these decisions will impact the funding levels of future awards.

Completed Actions

- ☑ Fully obligated funding authorized by CARES Act.
- ☑ Issued CARES Act Spending Plan.
- ☑ Established the Recovery Planning Task Force to look at pandemic's impact on grantees and NSF.
- ☑ Developed NSF Coronavirus Information webpage to share COVID-19 guidance with the award recipient community.

Ongoing NSF Actions

- ➢ Finalizing high level strategy for identifying and responding to risks and impacts of COVID 19 on both the agency and its recipients.
- ➢ Reviewing individual requests for grant extensions and supplemental funding.
- ➢ Continuing to update and share COVID 19 guidance with the award recipient community.

CHALLENGE 3 Managing the Intergovernmental Personnel Act Program

Why is this a serious management challenge?

This challenge involves an operation that is critical to an NSF core mission.

NSF gives scientists, engineers, and educators the opportunity to temporarily serve as NSF program directors, advisors, and senior leaders. Most non-permanent staff members are individuals assigned under the *Intergovernmental Personnel Act* (IPA, Pub. L. No. 91-648), who are not Federal employees but are paid through grants and remain employees of their home institutions. These individuals — hereafter referred to as IPAs or rotators — bring in fresh perspectives from across all fields of science and engineering to support NSF's mission. However, IPAs can have a heightened risk of conflicts of interest while working at NSF because most come from institutions receiving NSF grants. Also, because they only serve up to 4 years, there is frequent staff turnover at NSF, especially in senior leadership positions filled by IPAs. In addition, IPAs can spend up to 50 days each year on Independent Research/Development (IR/D) and their salaries are not subject to Federal pay and benefits limits.

NSF continues to strengthen its management of the program. For example, for all new IPA agreements initiated in FY 2017 and beyond, NSF requires every IPA's home institution, unless it requests a waiver, to pay 10 percent of the IPA's base salary and fringe benefits. An assessment indicated the cost-share percentage (based on the IPA's base salary and fringe benefits) gradually increased from 7.2 percent in FY 2016 to 10.4 percent in FY 2019. At the conclusion of FY 2019, NSF had realized significant cost avoidance with increased cost share dollars and participation rates each year.

COVID-19 has brought new and unique challenges to this program, including recruiting, onboarding, and managing IPAs in a remote work environment. It is unclear if institutions will be reluctant to allow staff to participate in the IPA program — and, if the number of IPAs decreases, whether NSF will be able to recruit qualified staff to fill any resulting openings. Fiscal concerns at institutions could also undermine the progress NSF has made in increasing cost-sharing for IPAs.

Completed Actions

- ☑ Submitted the IPA Program Annual Report.
- ☑ Approved IPA Cost Share Policy.
- ☑ Migrated executive-level IPAs along with NSF senior executive employees into USA Performance Management System.
- ☑ Submitted to Congress the FY 2019 annual response to the *American Innovation and Competitiveness Act* justifying rotator pay exceeding the maximum senior executive service pay.
- ☑ Integrated corrective actions in response to GAO report on renewing NSF goal of Adapting the Workforce to the Work.
- ☑ Engaged in IPA Program Enterprise Risk Management to clearly identify IPA Program objectives and associated risks.

Ongoing Actions

- ➢ Continuing to submit the IR/D Annual Report, covering program participation statistics, average days and dollars requested and used, and status of IR/D training and outreach.
- ➢ Continuing to provide annual training for IR/D experts, including updates to the IR/D Guide and the online electronic IR/D plan.
- ➢ Continuing to monitor turnover risk for IPAs.
- ➢ Continuing to use onboarding, training, knowledge transfer, and performance management systems in place to ensure that staff turnover has minimal impact on operations.

CHALLENGE 4 Providing Oversight of the Antarctic Infrastructure Modernization for Science (AIMS)

Why is this a serious management challenge?

This challenge involves an operation that is critical to an NSF core mission.

NSF, through the United States Antarctic Program (USAP), manages U.S. scientific research in Antarctica. Leidos Innovations Corporation (Leidos) currently holds the Antarctic Support Contract (ASC) for USAP logistical support. It is NSF's largest contract, valued at $2.3 billion over 13 years. NSF recently initiated a $410 million project to update and consolidate the footprint of McMurdo Station. The Office of Polar Programs (OPP), in coordination with the Division of Acquisition and Cooperative Support and the Large Facilities Office, is providing oversight of the Antarctic Infrastructure Modernization for Science (AIMS) project as a series of modifications to the existing ASC with Leidos and by following procedures in the *Major Facilities Guide*. This anticipated 10-year project, to be completed in phases, will stretch agency resources and may present additional challenges for NSF to overcome. OPP is also currently providing oversight of a separate ASC contract modification with Leidos to build an Information Technology & Communications (IT&C) primary facility — a key precursor to AIMS' success.

The advent of COVID-19 has added an unprecedented degree of complexity and uncertainty to the AIMS project. For example, while design and domestic fabrication of materials are continuing, AIMS construction on-ice at McMurdo has been put on hold and will require a complete rebaseline in FY 2021; the IT&C primary facility construction was also halted and will need rebaselining. Additionally, actions taken to keep Antarctica free of COVID-19, particularly those associated with rotating staff and contractors to and from the Antarctic continent, will have significant impacts on program operations and construction progress.

NSF has committed to completing the AIMS project with minimal impact on the scientific research that will continue to take place at McMurdo station. This commitment, the inherent risk of the ASC, the remote and isolated environment coupled with the harsh climate of Antarctica, the challenges presented by COVID-19, and the capacity of the prime contractor to effectively manage this complex project will require continued vigilance.

Completed Actions

- ☑ Partnered within NSF to identify areas the contractor needed to strengthen, which resulted in the contractor hiring additional staff, restructuring the office supporting the contract, and obtaining interagency support for cost analysis from the U.S. Army Corps of Engineers.
- ☑ Restructured the U.S. Army Corps of Engineers support being provided to the AIMS project by moving from cost reasonableness reviews to full independent cost estimates for proposal packages.
- ☑ Completed verification and acceptance of the AIMS Earned Value Management System in accordance with NSF policy.

Ongoing Actions

- ➢ Continuing oversight of the AIMS and IT&C Primary Addition Projects in accordance with established Internal Management and Project Execution Plans. Both projects require rebaselining due to COVID 19.
- ➢ Assessing COVID 19 impacts and evaluate options for minimizing negative impacts to AIMS cost and schedule.
- ➢ Working with the Office of Budget, Finance and Award Management to rebaseline AIMS, and subject the revised cost, scope, and schedule to external panel review, Facilities Readiness Panel Review, Director's Review Board Review, and National Science Board (NSB) re authorization of the Total Project Cost.

CHALLENGE 5 Increasing Diversity in Science & Engineering Education and Employment

Why is this a serious management challenge?

This challenge involves an operation that is critical to an NSF core mission.

In the Federal Government's 5-year strategic plan for STEM education, issued in December 2018, the Executive Office of the President's National Science and Technology Council reported:

> Women, persons with disabilities, and three racial and ethnic groups — Blacks or African Americans, Hispanics or Latinos, and American Indians or Alaska Natives — are significantly underrepresented in S&E [science and engineering] education and employment.

In August 2020, OMB directed 16 departments and agencies to prioritize investments that increase diversity, equity, and inclusion in STEM. Further, in its *Vision 2030*, the NSB estimated that to lead globally in S&E and to remain competitive, by 2030 the number of women in the S&E workforce must nearly double, the number of Black or African Americans must more than double, and the number of Hispanics or Latinos must triple compared to the respective numbers in the 2020 S&E workforce.

NSF maintains a comprehensive portfolio to increase diversity in S&E. The Broadening Participation portfolio focuses on awards with specific goals to increase participation of underrepresented groups. In addition, the NSF Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES) program, one of NSF's Big Ideas, focuses on scaling up proven approaches to broadening participation. NSF has issued two progress reports on NSF INCLUDES. They document the work of grantees, lessons learned on building connections, and corporate and Federal partnerships designed to broaden participation in STEM nationwide. Further, at its July 29, 2020 meeting, the NSB discussed working with NSF on the broader impacts criterion of merit review to foster a more inclusive S&E workforce. Members noted the *American Innovation and Competitiveness Act of 2017* (Pub. L. 114-329) lists increasing diversity in STEM as a broader impacts goal for NSF.

Actions taken by NSF and the NSB help alleviate the impact of COVID-19 on efforts to increase diversity in STEM research and education. A recent NSF-funded study[2] — an early snapshot of an evolving situation — found that Hispanic (12.7 percent) and Black (10.3 percent) STEM undergraduates were more likely than those identifying as Asian (6.3 percent) and White (6.0 percent) to delay graduation, and women faculty and students reported being more adversely affected by remote learning than did their male counterparts. In FY 2021, we will monitor NSF's continued efforts to develop strategies and programs to increase diversity in S&E education and employment and to measure their effectiveness.

Completed Actions

- ☑ Issued biannual *Women, Minorities, and Persons with Disabilities in Science and Engineering* reports.
- ☑ With NSB, issued *2019 Science & Engineering Labor Force* report and *The State of U.S. Science and Engineering 2020*.
- ☑ Contributed to NSB's Vision 2030.
- ☑ Created and twice evaluated the NSF INCLUDES portfolio.

Ongoing Actions

- ➢ Clarifying Broader Impacts criterion of Merit Review.
- ➢ Continuing NSF INCLUDES' activities and evaluations.
- ➢ Continuing to share *Indicators*, a quantitative summary of the scope, quality, and vitality of the S&E enterprise over time and within a global context.

[2] Saw, G. K., Chang, C.-N., Lomelí, U., & Zhi, M. Fall Enrollment and Delayed Graduation Among STEM Students during the COVID-19 Pandemic ([Network for Research and Evaluation in Education] Data Brief No. 1), July 15, 2020

CHALLENGE 6 Mitigating Threats Posed by Foreign Government Talent Recruitment Programs

Why is this a serious management challenge? There is a risk of fraud, waste, or abuse of NSF or other Government assets.

NSF, and other agencies that fund basic and advanced research, are facing increasing challenges from programs sponsored by some foreign governments or affiliates, referred to as "foreign government talent recruitment programs." These programs — designed to benefit the foreign state's economic development, industry, and national security by obtaining information and technology from abroad — have the potential to exploit the openness of American universities and threaten the integrity of U.S. research initiatives.

Talent recruitment programs target individuals with access to, influence over, or expertise in cutting-edge science, including NSF-funded researchers, merit review panelists, and career Federal employees or rotators who manage NSF's scientific programs. Some plans have required members to affirmatively demonstrate their involvement in research or technology development, sometimes by providing information that is proprietary. These plans often use contracts to establish the relationship between the plan and the researcher. The contracts can contain provisions related to the researcher's intellectual activities and outputs, which may raise significant questions about ownership of intellectual property developed with NSF funding and create conflicts of interests, time, and commitments. Failure to properly disclose membership in such programs can also have criminal or civil ramifications. In addition, many institutions funded by NSF could be affected by financial constraints driven by the pandemic, which could undermine their ability to identify and manage conflicts of interests, commitment, and affiliation created by researchers' involvement with such programs.

NSF has begun to take action to confront the challenges presented by foreign talent recruitment programs. NSF should continue to assess and refine its controls in this area and should work to ensure that it has sufficient staff and resources to respond to this challenge.

Completed Actions

- ☑ Required NSF IPA Program staff to be U.S. citizens or have applied for U.S. citizenship.
- ☑ Issued a personnel policy prohibiting NSF employees and IPA Program staff from participating in foreign government talent recruitment programs.
- ☑ Commissioned an independent study.
- ☑ Appointed an NSF Chief of Research Security Strategy and Policy to lead NSF's response.
- ☑ Published final 2020 *Proposal and Award Policies and Procedures Guide*, including clarifications regarding reporting requirements for current and pending support and professional appointments, to include participation in talent recruitment programs.
- ☑ Developed electronic formats for submission of biographies, appointment disclosures, and current and pending support information.
- ☑ Created science and security training for NSF staff.
- ☑ Issued new award terms and conditions regarding previously undisclosed information.

Ongoing Actions

- ➢ Strengthening and improving certifications relating to representations and disclosures made in proposals and other ongoing communications with NSF during the lifecycle of the award.
- ➢ Continuing coordination with other Federal agencies on science and security policies.

Appendix A: References

Please visit http://www.nsf.gov/oig for additional reports and publications.

Introduction

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Increasing Diversity in Science & Engineering Education and Employment

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Additional Information

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