National Science Foundation
Office of the Director

March 17, 2023

The Honorable Rosa DeLauro
Ranking Member
Committee on Appropriations
United States House of Representatives
Washington, D.C. 20515

Dear Ranking Member DeLauro:

Thank you for your letter of January 19, 2023, regarding potential funding scenarios for fiscal year (FY) 2024 and the impact on the National Science Foundation (NSF). The FY 2023 Consolidated Appropriations Act includes historic investments in NSF and the agency is committed to utilizing those resources wisely to position the Nation for continued leadership in science, engineering, and technology for decades to come.

Since its establishment in 1950, NSF has been a critical component in powering the United States economy, transforming American lives, and securing the national defense. Many of the technological advances we are benefiting from today such as Artificial Intelligence, Quantum Information Science, and Biotechnology are rooted in sustained investment over many decades. However, we currently face intense global competition in a number of these key technology areas and workforce capacity. Our success in unlocking the promise of these and other technological developments and scientific breakthroughs will determine our continued global leadership and are central to our economic and national security.

With the passage of the CHIPS and Science Act of 2022, Congress put in place a roadmap for meeting this challenge, while also spurring innovation in communities in all regions of the country. The law codifies NSF's new Directorate for Technology, Innovation and Partnerships (TIP), and positions the agency to capitalize on the uniquely American research ecosystem that includes academia, private industry, the government, and other partners to quickly translate research into impacts that benefit the Nation. In addition, NSF is the only agency that invests in research in every area of science, engineering and technology – making up the majority of federal investments in basic research in areas such as computer science, mathematics and biology. Through these investments, NSF plays a major role in inspiring and training the next generation STEM workforce – through K-12 informal STEM education, technical training, support for graduate and PhD students, and experiential learning. NSF's role in workforce training has become increasingly important with the significant investments in semiconductor manufacturing, which will require strong partnerships between the federal government, academia, and private industry to training the needed workforce.

Recognizing the need to increase these investments, Congress authorized a doubling of the NSF budget over the next five fiscal years in the CHIPS and Science Act, with an authorization level of $11.9 billion in FY 2023 and $15.6 billion in FY 2024. Reductions in funding from the FY23

enacted level will not only limit the agency's ability to continue to support and scale important fundamental research in all areas of science, engineering, and STEM education, but it will also hamstring efforts to advance the translational and regional innovation efforts required by the CHIPS and Science Act, which are pivotal to the United States' global leadership in key technologies. A reduction to NSF's 2023 Enacted level to FY 2022 would result in the agency making approximately 2,200 fewer awards and able to support over 31,000 fewer researchers, students and others who are critical to our Nation's science, engineering and technology enterprise. Reducing the FY 2023 Enacted levels by 22% would lead to approximately 4,600 fewer awards and approximately 66,000 people who could not be supported in their pursuit of STEM.

These results would have direct negative impacts in key emerging technology areas. For example, NSF is the Nation's largest non-defense Federal funder of AI research. Many of America's most beneficial AI innovations have their roots in NSF-funded research. Already, NSF declines over 80% of proposals in this topic area, including declining hundreds of millions of dollars of highly-rated research proposals each year. A loss of American AI research leadership would mean long-term that the AI systems American people engage with in their everyday lives are more likely to have been developed by technologists from non-like-minded companies/countries. In addition, these cuts would mean reducing funding for the ExpandAI program, which aims to increase the diversity of researchers and institutions in AI research. We know that reducing AI researcher diversity can in turn be detrimental to the equity and trustworthiness of AI systems created by America's researchers and technologists. Finally, AI innovations are key drivers of semiconductor innovations and market volumes. Reducing AI research investments will have follow-on effects on the ability for CHIPS and Science legislation to succeed in its goal of re-onshoring American semiconductors.

Such a reduction in NSF funding would also inhibit advances in future microelectronics and semiconductor technologies and student training. This includes important work in the areas of research and fabrication, which are necessary for rebuilding the Nation's microelectronics and semiconductor industry, for ensuring a secure and reliable U.S.-based supply of microelectronics and semiconductors, and for reducing the energy costs of computing, data centers, and electronic devices. Curtailed NSF investments could also affect the Nation's ability to overcome the high cost of developing, leveraging, implementing, and integrating technical innovations, to overcome supply chain challenges, to expand the use of environmentally safe materials, to reduce product costs, and to support the workforce needs of industry.

Furthermore, the reduction in NSF funding would impede discoveries in biomanufacturing, cybermanufacturing, eco manufacturing, semiconductor manufacturing, and quantum manufacturing, which the U.S. needs in order to compete globally in manufacturing, to create and maintain U.S.-based jobs in manufacturing, and to enable technologies in other emerging industries to fully impact society.

In the field of quantum information science and engineering (QISE), the National Quantum Virtual Laboratory (NQVL) would not be able to start, delaying the translation from research to technology in QISE. And reduced investment in NSF's ExpandQISE program, would reduce the volume and diversity of QISE workforce development across the country, thereby making the US less competitive in QISE worldwide. QISE could transform fields like computing and communications, and holds enormous economic and national security potential and implications. This is also true in Biotechnology, where NSF would not be able to advance data infrastructure for the bioeconomy, limiting the ability to translate discoveries into products. In addition, NSF would not be able to fully implement a national network of biofoundries. This would limit the ability to provide prototyping capacity and reduce access to infrastructure for modern biotechnology.

There would also be significant impacts to the Nation's S&T workforce development. NSF supports experiential learning opportunities for diverse talent at all levels, including today's workforce looking to pivot into tomorrow's high-wage, good-quality jobs in AI, quantum, biotechnology, and other key technology areas. These investments support hundreds of thousands of future researchers, practitioners, technicians, entrepreneurs, and educators. For example, the Nation needs to train 280,000 new workers in semiconductors and microelectronics over the next five years to keep pace with the rest of the world. A 22% reduction would preclude NSF from being able to reach an estimated 10,000 individuals in FY 2024, threatening this goal and long-term U.S. competitiveness in semiconductors and other key technologies.

Finally, NSF anticipates funding 8-12 Regional Innovation Engines (RIEs), and dozens of RIE planning grants with FY 2023 funds. These will accelerate technology development by catalyzing innovation ecosystems throughout the country, particularly in those regions that have been underserved or underrepresented in the Nation's economy over the last several decades. A 22% reduction would require pausing a quarter of these NSF Engines in year 2, directly affecting the Nation's ability to out-compete China and other nations with a unique American asset – the full breadth and diversity of our nation's geography and demography.

These lost opportunities will prove detrimental to our national security and global competitiveness as we see our competitors continue to increase investment in these same areas. Furthermore, our ability to safeguard those investments by implementing the research security provisions in the CHIPS and Science Act would also be diminished with reduced funding. Specifically, NSF's ability to mature the Research Security and Integrity Information Sharing and Analysis Organization would be significantly impacted. This includes our ability to provide tailored recommendations to the STEM education community on research security risks and the reach of our training and communication on known security threats and the lessons learned from protection and response efforts.

As you know, President Biden has released his FY 20224 Budget to invest in America, continue to lower costs for families, protect and strengthen Social Security and Medicare, and reduce the deficit. This plan includes investments at NSF that will promote global leadership in emerging

technologies, expand the STEM workforce, and boost research and development, including research infrastructure.

We greatly appreciate your interest in the work of the National Science Foundation. Please feel free to contact Amanda Hallberg Greenwell, Head of the Office of Legislative and Public Affairs, at (703) 292-8070 if you have any additional questions.

Sincerely,

Sethuraman Panchanathan
Director