Expanding Capacity in Quantum Information Science and Engineering (ExpandQISE)

PROGRAM SOLICITATION
NSF 22-561

National Science Foundation

Directorate for Mathematical and Physical Sciences

Directorate for Education and Human Resources

Directorate for Computer and Information Science and Engineering

Directorate for Engineering

Directorate for Biological Sciences

Office of Integrative Activities

Office of International Science and Engineering

Directorate for Social, Behavioral and Economic Sciences

Letter of Intent Due Date(s) *(required)* (due by 5 p.m. submitter's local time):

April 01, 2022

Track 2 proposals

February 03, 2023

Track 2 proposals

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

May 06, 2022

Track 2 proposals

June 03, 2022

Track 1 proposals

March 03, 2023

Track 2 proposals

April 07, 2023

Track 1 proposals

IMPORTANT INFORMATION AND REVISION NOTES

Innovating and migrating proposal preparation and submission capabilities from FastLane to Research.gov is part of the ongoing NSF information technology modernization efforts, as described in Important Notice No. 147. In support of these efforts, proposals submitted in response to this program solicitation must be prepared and submitted via Research.gov or via Grants.gov and may not be prepared or submitted via FastLane.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 22-1), which is effective for proposals submitted, or due, on or after October 4, 2021.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Expanding Capacity in Quantum Information Science and Engineering (ExpandQISE)

Synopsis of Program:

The NSF Expanding Capacity in Quantum Information Science and Engineering (ExpandQISE) program aims to increase research capacity and broaden participation in Quantum Information Science and Engineering (QISE) and related disciplines through the creation of a diversified investment portfolio in research and education that will lead to scientific and engineering breakthroughs, while securing a talent pipeline in a field where workforce needs of industry, government and academia continue to outgrow the available talent. **This funding opportunity applies to Institutions of Higher Education that in the most recent five calendar years before publication of this solicitation received not more than $5,000,000 total in federal funding for QISE research as described in Focus areas 1, 2, and 3, in Section II "Program Description" of this solicitation.** The ExpandQISE program helps build and maintain a close connection between new efforts and existing impactful work done at the existing QISE Centers or leading QISE research Institutions, while creating and nurturing necessary critical mass at Institutions not yet fully involved in QISE. In keeping with the NSF goal of increasing the participation of all members of society in the scientific enterprise, institutions at which more than 50% of enrolled students come from groups that are currently under-represented in the sciences, e.g. minority-serving institutions (MSIs), are especially encouraged to apply.

Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

- Tomasz Durakiewicz, MPS, telephone: (703) 292-4892, email: tdurakie@nsf.gov
- John D. Gillaspy, MPS, telephone: (703) 292-7173, email: JGILLASP@nsf.gov
- Luis A. Cubano, EHR, telephone: (703) 292-7941, email: lcubano@nsf.gov
- Abiodun Ilumoka, EHR, telephone: (703) 292-2703, email: ailumoka@nsf.gov
- Vinod K. Lohani, EHR, telephone: (703) 292-2330, email: vlohani@nsf.gov
- Wu He, EHR, telephone: (703) 292-7593, email: wuhe@nsf.gov
- Nadia A. El-Masry, ENG, telephone: (703) 292-4975, email: nelmasry@nsf.gov
- Rosa Lukaszew, ENG, telephone: (703) 292-8103, email: rlukasze@nsf.gov
- Pinaki Mazumder, CISE, telephone: (703) 292-7375, email: pmazumde@nsf.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.041 --- Engineering
- 47.049 --- Mathematical and Physical Sciences
- 47.070 --- Computer and Information Science and Engineering
- 47.074 --- Biological Sciences
- 47.075 --- Social Behavioral and Economic Sciences
- 47.076 --- Education and Human Resources
- 47.079 --- Office of International Science and Engineering
- 47.083 --- Office of Integrative Activities (OIA)

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 50 to 62

- Track 1: Individual PI awards: up to 25 awards in FY22 and up to 25 awards in FY23
- Track 2: Team awards: up to 6 awards in FY22 and up to 6 awards in FY23

Anticipated Funding Amount: $20,000,000

- Track1 awards are anticipated to be up to $800,000 total per award for a duration up to 3 years pending the availability of funds and quality of proposals received.
- Track 2 awards are anticipated to be up to $5,000,000 total per award for a duration up to 5 years pending the availability of funds and quality of proposals received.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- The proposal must be submitted by Institutions of Higher Education (IHEs) accredited in, and having a campus located in the US, that in the 5 calendar years before publication of this solicitation received a total of not more than $5,000,000 from all federal funding sources for QISE research as described in Focus areas 1, 2, and 3 in Section II "Program Description". As part of the submission

process the IHE must attest to the fact that this funding level has not been exceeded.

See 'Eligible Institutions of Higher Education' in this program solicitation for a complete description.

Funding of partnering institutions must be requested via subawards; any Institution of Higher Education is eligible to be named as a subawardee institution. Separately submitted collaborative proposals will not be accepted. Total amount of subawards to Institutions not eligible to submit as Lead Institutions are limited to no more than 30% of the full award amount.

Who May Serve as PI:

By the submission deadline, the Principal Investigator must hold either:

- a tenured or tenure-track position, or
- a full-time, paid appointment to a research or teaching position

at a US-based campus of an IHE eligible to submit to this solicitation, as described in detail in the 'Eligible Institutions of Higher Education' section.

At least one PI/co-PI must be identified, who must (i) hold a full-time faculty appointment at an Institution of Higher Education, and (ii) show evidence of an established and productive research career in the area of Quantum Information Science and Engineering.

Limit on Number of Proposals per Organization:

Up to two (2) Track 2 proposals per lead institution are allowed. There are no limits on the number of Track 1 proposals.

Limit on Number of Proposals per PI or co-PI: 1

There is a limit of one proposal per PI, independently of the track.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Submission of Letters of Intent is required. Please see the full text of this solicitation for further information.

- **Preliminary Proposal Submission:** Not required

- **Full Proposals:**

  - Full Proposals submitted via Research.gov: *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) guidelines apply. The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.
  - Full Proposals submitted via Grants.gov: *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov* guidelines apply (Note: The *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide).

B. Budgetary Information

- **Cost Sharing Requirements:**

  Inclusion of voluntary committed cost sharing is prohibited.

- **Indirect Cost (F&A) Limitations:**

  Not Applicable

- **Other Budgetary Limitations:**

  Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

- **Letter of Intent Due Date(s)** *(required)* (due by 5 p.m. submitter's local time):

  April 01, 2022

    Track 2 proposals

  February 03, 2023

    Track 2 proposals

- **Full Proposal Deadline(s)** (due by 5 p.m. submitter's local time):

  May 06, 2022

    Track 2 proposals

  June 03, 2022

Track 1 proposals

March 03, 2023

Track 2 proposals

April 07, 2023

Track 1 proposals

Proposal Review Information Criteria

Merit Review Criteria:

National Science Board approved criteria. Additional merit review criteria apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions:

Standard NSF award conditions apply.

Reporting Requirements:

Standard NSF reporting requirements apply.

TABLE OF CONTENTS

I. INTRODUCTION

Rapid development of broad, convergent, impactful, and productive Quantum Information Science and Engineering (QISE) research in the US together with translation efforts expected to lead to the emergence of a multitude of practical quantum technology applications. The convergent discipline of QISE unites two of the pillars of 20th century science, namely quantum mechanics and information theory, with biology, chemistry, computer science, device engineering, materials science, mathematics, and a number of other disciplines to provide a framework that can be utilized to promote the processing, transmission, and measurement of information based on fundamental understanding and control of quantum properties. Current and future QISE applications stem from distinct quantum phenomena, such as superposition and entanglement, that do not have classical counterparts. The development of these new applications forms the basis of one of the major technological revolutions of the 21st century.

Developing a sufficient pool of diverse and multi-disciplinary talent suitable for workforce participation in the US is also an essential requirement for the future success of the QISE enterprise. Besides fundamental and applied research, rapid developments in the vibrant field of QISE also offer new and unique opportunities and challenges when it comes to workforce, education, and broadening participation.

This program is designed to engage the full spectrum of research talent in the academic community to address the need for future workforce, while opening up the participation in QISE to a broad range of communities. Recognizing that different institutions may be at different stages in the focus on research as a component of the educational enterprise of the institution, the program strongly encourages partnerships with external collaborators with deep QISE research expertise and easy access to QISE research infrastructure.

NSF recognizes that the current level and footprint of investment in QISE is not sufficient to meet the workforce needs of the future. NSF is also cognizant of the need to expand the QISE research and workforce capacity by leveraging research-focused institutions in the United States, many if not most of which do not have robust research programs in QISE. By encouraging such institutions to treat QISE as a focus area, NSF seeks to rapidly increase the pool of highly trained scientists, engineers, and technicians in this rapidly advancing space.

The program is designed to enable colleges and universities whose current research programs in QISE can be characterized as non-existent, or at the nascent stages, but have a strong interest in developing vibrant QISE efforts in research and education. The program seeks to support such institutions by providing resources to faculty to develop research and education activities that contribute to the national discussion and that offer opportunities for students at all levels to engage in QISE-related research.

The research activity can be viewed as the platform on which to develop the needed workforce, so the program places heavy emphasis on the training opportunities offered to the students as part of the research efforts. Specifically, the program is open to higher education applicants that do not at the present time have faculty members engaged in QISE research to any notable extent. In keeping with the NSF goal of increasing the participation of all members of society in the scientific enterprise, the extent to which the proposal can address this goal will be taken into account in the review process. Institutions at which more than 50% of enrolled students come from groups that are currently under-represented in the sciences, e.g. minority-serving institutions (MSIs), are especially encouraged to apply.

The ExpandQISE program envisions two distinct tracks:

- Track 1 is designed for individual PIs initiating planning for a research program in QISE, paired with an external co-PI with deep QISE research expertise as noted above.
- Track 2 is designed for small- to medium-scale teams of 2 to 5 collaborators, also paired with one or more external co-PIs with deep QISE research expertise as noted above.

II. PROGRAM DESCRIPTION

The ExpandQISE program is designed to help (i) build capacity and infrastructure such as laboratories, people, training, local support, and critical mass across eligible US Institutions of Higher Education who want to engage significantly in QISE, (ii) increase competitiveness of research faculty and the institution in future funding calls and opportunities, and (iii) leverage the readiness for involvement of local research and education communities in building up the capability. For the lead role, the program is open to eligible institutions that either do not currently have faculty members engaged in QISE research to any notable extent and to those institutions that may have a minor level of engagement in QISE but are intending to increase the existing footprint in the area, as described in the eligibility criterion. For the collaborative role, supported through a sub-award from the lead institution, the program is open to all eligible US Institutions of Higher Education.

The program seeks to address the NSF goal of increasing the participation of all members of society in the scientific enterprise through research. All US-based Institutions of Higher Education with nonexistent or minimal footprint in QISE research are encouraged to apply. For institutions at the early stage of participation in QISE research, it is critical to establish and develop a close connection with existing institutions possessing cutting-edge research and infrastructure. This is accomplished by a requirement of collaboration with at least one Co-PI or Co-PIs from other institutions with established and productive programs in QISE. The total amount of subawards to Institutions not eligible to submit as Lead Institutions are limited to no more than 30% of the full award amount.

II.A. FOCUS AREAS.

The convergent nature of QISE is expressed in integrating expertise from domains such as physics, materials science, engineering, mathematics, chemistry, computer and information science and engineering, and biology. With QISE at its heart, the ExpandQISE program specifically answers to the needs of the rapidly expanding field of research under three scientific Focus Areas. All proposals must address the scientific merit of the activities in at least one of these three Focus Areas: Quantum Fundamentals, Quantum Metrology and Control, Co-Design and Quantum Systems. In addition, each proposal must include a specific activity in Focus Area 4, Education and Workforce Development, as outlined below.

Focus Area 1: Quantum Fundamentals, which advances the fundamental understanding of uniquely quantum phenomena and their interfaces with classical systems under a broad range of conditions. Example research drivers in this category may include, but are not limited to:

- Understand and control quantum decoherence;
- Generate, characterize and manipulate quantum entangled states;
- Characterize, verify and exploit quantum algorithms and simulations for exponential speedup and their application to increased range of computational and other problems, including expanding quantum complexity theory;
- Discover, analyze and understand the fundamental properties of novel quantum many-body states of matter with tailored properties that can be exploited for quantum technologies, including control of multiple degrees of freedom using light-matter interactions at fine resolutions;

Focus Area 2: Quantum Metrology and Control, which aims to transform our ability to measure, model, control, and exploit quantum phenomena in single and multi-particle systems.
Example research drivers may include, but are not limited to:

- Utilize quantum superposition of states, entanglement and quantum squeezing in metrology;
- Characterize and minimize noise and develop, test and implement quantum error corrections in quantum computing environments; and
- Develop efficient high-resolution methods to generate, control, manipulate, read, and write quantum bits (qubits).

Focus Area 3: Co-Design and Quantum Systems, where application-specific hardware and algorithms are designed for development of stable, controllable, scalable, error-free, low-dissipation platforms for a wide of range of states. Example research priorities may include, but are not limited to:

- Identify advantages, limitations and interfacing of quantum and classical circuit and computing devices to optimally design monolithic or hybrid systems targeted to serve various applications;
- Develop quantum circuits, system designs and programming paradigms for quantum sensing, computing and communication; develop and validate viable platforms for quantum computing and testbeds for rapid prototyping, system characterization and optimization; and system integration techniques for combining quantum and classical computing platforms;
- Learn how to generate, on demand, scalable systems of quantum objects in superposition states, with properties tailored to a specific use, while

enabling information exchange between different types of such objects and across the quantum-classical boundary;
- Explore novel and emergent applications of quantum information technology.

In the context of the National Strategic Overview for Quantum Information Science, the proposed research plan must fit within the scope of at least one of the four areas of QISE identified therein: quantum computing, quantum sensing, quantum communications or quantum simulations. Proposals must explicitly identify one or more of the areas.

Focus Area 4: Education and Workforce Development, which will increase the spectrum of graduate and/or undergraduate programs and the number of students applying to the programs, and enhance the diversity of the programs by closely connecting the graduate/undergraduate programs to convergent QISE research and removing barriers for entry. Depending on the level of resources available to each track, education and workforce-development activities may include, but are not limited to:

- The development of new degree programs in QISE;
- The development of new QISE-relevant curricula;
- The creation of opportunities for students to interact with industry, for example through collaboration on research projects, internships, fellowships or entrepreneurial activities;
- The implementation of effective and evidence based educational approaches leading to development of skilled and diverse QISE workforce through formal and informal education.

II.B PROGRAM GOALS

Linked to any of the first three Focus Areas, the overarching research goal is to achieve impactful advances in QISE by exploring the fundamental science of quantum sensors, quantum computing and quantum networks in all relevant convergent disciplines such as: computer and information sciences and engineering, physics, materials science, chemistry, mathematics, etc., and at varying levels of complexity, from quantum fundamentals to quantum devices and quantum systems.

Measures of Success: The long-term aim of the ExpandQISE program is to create conditions necessary for the emergence of a vibrant, productive, and sustained QISE research community that extends to all regions of the U.S. The program is expected to lead to an increase in QISE scientific research outcomes, improve retention in QISE-relevant graduate and undergraduate programs, and increase the number of students applying to and graduating from these programs, while achieving continuous and sustained productivity of funded efforts by investing in needed people and infrastructure. Coupled with institutional efforts over the long-term, this program seeks to achieve local impact by catalyzing involvement of communities, private and public institutions, industrial partners, and local governments.

II. C. PROGRAM TRACKS

Track 1: individual PI awards, is designed for individual PIs initiating planning for a research program in QISE, paired with an external co-PI. Track 1 award funding is up to $800,000 total per award for up to 3 years.

Track 2: team awards, is designed for small- to medium-scale teams of 2 to 5 collaborators, also paired with one or more additional external Co-PIs as noted above. Track 2 award funding is up to $5,000,000 total per award for a duration of up to 5 years.

In keeping with the institution's own best plans for achieving its own development goals, flexibility is provided in terms of relative weight of support for the following types of required activities.

Required Components and Allowable Costs: All components required for Track 1 proposals are also required in Track 2 proposals, with specific additional requirements for Track 2.

Track 1 required components:

- Strong and compelling research proposal at the core of all activities. The research plan must be aligned with one or more of the three Focus Areas 1, 2, and 3 described in Section II.A and be well integrated with the workforce development plan described in Focus Area 4.
- External connection. The research project must be connected to established and productive research effort or efforts in the area of Quantum Information Science and Engineering, with a key person or persons representing that effort acting as co-PI of the proposal. Funding may be provided to these entities through a subaward of up to 30% of total budget. No more than 30% of budget can be allocated to external connection.
- Education. The proposal needs to include plans to integrate QISE principles and research outcomes into existing courses or new coursework

Track 1 allowable costs can include:

- Release time or summer salary for faculty, consistent with NSF limits across all NSF awards.
- Faculty and Staff training costs in allowable areas related to program research, management, and institutional support.
- Travel and networking costs for establishing collaborations
- Student support
- Materials and small equipment purchase and installation. Materials and equipment costs in Track 1 proposals must be explicitly associated with the research project and the need appropriately justified. The total materials and small equipment request cannot exceed 20% of total award budget.

Track 2 required components. All Track 1 required components are also required in Track 2. In addition, the following components are also required in Track 2:

- Faculty line building: A faculty development plan providing details of planned faculty development and demonstrating commitment to building a critical mass of tenured or tenure-track faculty to expand and maintain capacity.
- Institutional Sustainability Plan, containing (i) a convincing design for expansion and continuation of QISE efforts at the Institution beyond the award duration, including plans for faculty line development, infrastructure, and resources, matching the Institution's vision of future QISE research effort, (ii) a statement confirming readiness to grant release time to faculty if needed for performing duties associated with the award, (iii) a partnership plan describing the Institutional vision of collaboration with local industry, government, private organizations and/or other institutions to expand the impact of activities. A timetable of planned activities must be included. The Institutional Sustainability Plan is written and signed by the Institution president, provost, or appropriate designee authorized to speak on behalf of the Institution and able to guarantee implementation of the Plan.
- Within the proposal text, a clear description must be given outlining how access to all the infrastructure needed to pursue the proposed research will be provided, either on-site, or via partnership, access to external facilities and/or collaboration, and role and timetable of specific instrumentation purchases, development and installation.
- Academic Degree Program: The proposal should include plans for the development of new, or re-focusing of existing Associate, Bachelors and/or

Masters degree academic programs that support QISE training.
- Describe the formation and operation plan of a 3-person External Advisory Board (EAB), charged with periodic assessment of funded activities, and evaluating progress in achieving the goals of the Institutional Sustainability Plan. EAB members must be established and recognized researchers in the field of QISE. To avoid potential conflicts of interest during the NSF review process please do not contact potential EAB members before award is made, and do not include names of potential EAB members in the proposal text.

Track 2 allowable costs can include, in addition to costs allowed in Track 1:

- Equipment and Materials and Supplies: Acquisition of instrumentation necessary to establish an in-house activity that forms the basis of a dedicated program in QISE. Equipment and materials cost in Track 2 proposals must be explicitly associated with the research project and the need appropriately justified. Total materials and equipment costs in Track 2 proposals cannot exceed 35% of proposal budget and must be part of the lead institution's budget and not part of a sub-award.
- Faculty Line building costs, including salary support for the first two years for new faculty when hired into tenure-track positions.
- Costs associated with operation of the External Advisory Board (required) and external evaluator (if applicable).

III. AWARD INFORMATION

NSF expects to make Standard Grants or Continuing Grants. The estimated number of awards will be up to 25 awards in Track 1 and up to 6 awards in Track 2. Fiscal Year 2022 awards are anticipated to be effective in October 2022, and Fiscal Year 2023 awards are expected to be effective in October 2023. The total anticipated funding amount in FY 2022 is approximately $20,000,000. Awards are expected to be up to $800,000 per award for up to 3 years in Track 1 and up to 5,000,000.- for up to 5 years in Track 2 awards. Estimated program budget, number of awards and average award size/duration are subject to the availability of funds and receipt of competitive proposals.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- The proposal must be submitted by Institutions of Higher Education (IHEs) accredited in, and having a campus located in the US, that in the 5 calendar years before publication of this solicitation received a total of not more than $5,000,000 from all federal funding sources for QISE research as described in Focus areas 1, 2, and 3 in Section II "Program Description". As part of the submission process the IHE must attest to the fact that this funding level has not been exceeded.

  See 'Eligible Institutions of Higher Education' in this program solicitation for a complete description.

  Funding of partnering institutions must be requested via subawards; any Institution of Higher Education is eligible to be named as a subawardee institution. Separately submitted collaborative proposals will not be accepted. Total amount of subawards to Institutions not eligible to submit as Lead Institutions are limited to no more than 30% of the full award amount.

Who May Serve as PI:

By the submission deadline, the Principal Investigator must hold either:

- a tenured or tenure-track position, or
- a full-time, paid appointment to a research or teaching position

at a US-based campus of an IHE eligible to submit to this solicitation, as described in detail in the 'Eligible Institutions of Higher Education' section.

At least one PI/co-PI must be identified, who must (i) hold a full-time faculty appointment at an Institution of Higher Education, and (ii) show evidence of an established and productive research career in the area of Quantum Information Science and Engineering.

Limit on Number of Proposals per Organization:

Up to two (2) Track 2 proposals per lead institution are allowed. There are no limits on the number of Track 1 proposals.

Limit on Number of Proposals per PI or co-PI: 1

There is a limit of one proposal per PI, independently of the track.

Additional Eligibility Info:

Eligible Institutions of Higher Education

Lead Institution: ExpandQISE proposals may be submitted by Institutions of Higher Education that in 5 calendar years before publication of this solicitation received not more than $5,000,000 from all federal funding sources for QISE research as described in Focus areas 1, 2, and 3 in Section II.B. Eligibility of Lead Institution in the context of past funding is certified by a Letter from Authorized Organizational Representative, such as head of the Sponsored Research Office or its equivalent, or President of the Institution.

Non-lead Institution: Each ExpandQISE proposal must be submitted with a Co-PI from any Institution of Higher Education (IHEs), accredited and having a campus in the US who has an established and productive research program in the area of Quantum Information Science and

Engineering, such as a member or leader of a strong and impactful team working in the area of QISE or NSF-funded QISE-relevant Center. The proposal may include subawards to such institutions, consistent with the proposed partnership activities, with cumulative cost of subawards not exceeding 30% of total award budget.

The past funding limit of $5,000,000 in 5 years does not apply to non-lead institutions.

IHEs eligible to submit Track 2 proposals as Lead Institution must award degrees in QISE-related disciplines.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Letters of Intent *(required)*:

Submission of Letters of Intent is required only for Track 2 proposals. Letters of Intent must be submitted prior to Full Proposal submission by the specified Due Date (see "Due Dates"). No more than three Letters of Intent per organization as the lead institution are allowed. There are no limits to how many times individuals may appear as Senior Personnel (Principal Investigator/Project Director, co-PI, and Faculty Associate or equivalent) on Letters of Intent.

Letters of Intent must include the following:

- Program Solicitation Title.
- Selection of Primary NSF Organization/Division to process the proposal.
- Proposal title.
- Synopsis (maximum 2500 characters): Proposed vision, key components, main activities, and major goals of the proposed activity.
- Other Comments (maximum 2500 characters): a list of Senior Personnel (Principal Investigator, co-PI(s), and Faculty Associate(s) or equivalent), including funded and unfunded collaborators, and providing names, affiliations, email and area(s) of expertise for all participants. Estimated total budget for each year of award.

Letter of Intent Preparation Instructions:

When submitting a Letter of Intent through Research.gov in response to this Program Solicitation please note the conditions outlined below:

- Submission of up to 3 Letters of Intent per Lead Institution is permitted.

Letter of Intent Preparation Instructions:

When submitting a Letter of Intent through Research.gov in response to this Program Solicitation please note the conditions outlined below:

- Submission by an Authorized Organizational Representative (AOR) is required when submitting Letters of Intent.
- A Minimum of 0 and Maximum of 4 Other Senior Project Personnel are permitted
- A Minimum of 1 and Maximum of 4 Other Participating Organizations are permitted
- Submission of multiple Letters of Intent is permitted

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Research.gov or Grants.gov.

- Full Proposals submitted via Research.gov: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal and Award Policies and Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg. Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov. The Prepare New Proposal setup will prompt you for the program solicitation number.
- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov*. The complete text of the *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov.

See PAPPG Chapter II.C.2 for guidance on the required sections of a full research proposal submitted to NSF. Please note that the proposal preparation instructions provided in this program solicitation may deviate from the PAPPG instructions.

Unless noted otherwise, the content of this Section applies to both Track 1 and Track 2 proposals.

If multiple universities are involved, the proposal must be submitted as a single full proposal with subawards, and not as separately submitted collaborative proposals.

The following instructions supplement the guidance in the PAPPG and Grants.gov Application Guide.

Proposal Title: The proposal title must begin with "ExpandQISE:", followed by "Track 1:" or "Track 2:", depending on track chosen, and followed by an informative project title.

Project Description for Track 1 proposals (maximum 15 pages) must include the following subsections:

- **Vision and Goals**: Describe the vision and specific goals of the proposed research linked to at least one of the Focus Areas, explicitly addressing how it will build capacity and create conditions necessary for emergence of a vibrant, productive and sustained OISE research community beyond the current practitioners.
- **Approach and Methodology**: Describe the approach and methodology that will be used to achieve the research vision and goals.
- **Proposed Research**: Strong and compelling research proposal at the core of all activities: research plan must be aligned with at least one of the Focus Areas and be well integrated with other proposed activities such as involvement of students, education and outreach efforts.
- **Thrust Area(s):** Describe the activities envisioned and the expected outcome(s), as well as possible inter-relation and/or feedback between the different efforts/topics.
- **Role of External Connection**: describe the role of, and leverage provided by collaboration with the external Co-PI or Co-PIs, which may be funded through a subaward of up to 30% of the total budget, and forming a connection with established and productive research projects, centers, institutions and other efforts enabled by investments made by NSF, DOE and NIST in the area of QISE.
- **Workforce Development**: Describe how the proposed project builds capacity and expand the talent pool within QISE, enhance U.S. competitiveness in the area, and grow the diverse QISE research community.
- **Results from Prior NSF Support:** Please follow the guidance provided in the NSF Proposal & Award Policies & Procedures Guide (PAPPG) for reporting results from prior NSF support. Please also describe the prior research of each PI or co-PI funded by NSF that is directly relevant to the proposed project.
- **Broader Impacts:** This section addresses the planned Broader Impact activities encompassing the potential to benefit society and contributing to the achievement of specific, desired societal outcomes.

Project Description for Track 2 proposals. (maximum 25 pages) Project description for Track 2 proposals must include ALL information required for Track 1 proposals as listed under "Project Description for Track 1 proposals", and in addition, the following subsections:

- **Faculty Development Plan**: Provide details on planned means of faculty development, demonstrating commitment to building a critical mass of tenured or tenure-track faculty to expand and maintain capacity. Provide a description of communication strategy, data tracking, management of personnel within the project group, management of intellectual property resulting from the project, and timeline of activities.
- **Discussion of the Institutional Sustainability Plan**: This subsection must contain a discussion of the Institutional Sustainability Plan (ISP) prepared by the Institution and attached as Supplementary Document, and include details regarding approaches, methods and timeline of activities funded under this award and relevant to implementation of the ISP, including a detailed timetable of institutional sustainability activities. This subsection is not a copy of ISP.
- **Academic Degree Program**: describe planned development of new, or re-focusing of existing, Bachelor's and/or Master's degree academic programs that support QISE training.
- **External Advisory Board**: Describe the formation of a 3-person External Advisory Board (EAB), charged with periodic assessment of funded activities, and evaluating progress in achieving the goals of the Institutional Sustainability Plan. EAB members must be established and recognized researchers in the field of QISE. To avoid potential conflicts of interest during NSF review please do not contact potential EAB members before award is made, and do not include names of potential EAB members in the proposal text.
- **Infrastructure:** provide a description and a table of equipment to be purchased, including purpose and cost, as well as purchasing, delivery, and installation timeline. All acquisition of instrumentation necessary to establish an in-house activity that forms the basis of a dedicated program in QISE needs to be described in this section. Total materials and instrumentation cost in Track 2 proposals cannot exceed 35% of proposal budget.

Supplementary Documents.

The proposal should include applicable supplementary documents as instructed in the PAPPG. The following items are to be provided as additional supplementary documents.

The following supplementary documents are allowed both for Track 1 and Track 2 proposals:

- **Letters of Collaboration** (maximum 1 page per letter): Letters of collaboration from other Institutions, industrial partners, national laboratories and all other funded or unfunded collaborators may be included. Such letters should follow the format required by the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG), and be limited to stating the intent to collaborate. Details about collaborative work to be done under this project should be included within the Project Description, not in supplementary documents.

The following supplementary documents are required both for Track 1 and Track 2 proposals:

- **Eligibility Letter** (maximum 1 page): Lead Institution: ExpandQISE proposals may be submitted by Institutions of Higher Education that in 5 calendar years before publication of this solicitation received not more than $5,000,000 from all federal funding sources for QISE research, as described in Focus areas 1, 2, and 3 in Section II "Program Description". For Track 1 proposals, eligibility of Lead Institution in the context of past funding is certified by a Letter from Authorized Organizational Representative, such as head of the Sponsored Research Office or its equivalent, or President of the Institution, or by Vice-President for Research, or by Provost. For Track 2 proposals, Letter is prepared and signed by University President, or by Vice-President for Research, or by Provost. Eligibility Letters are required from all Eligible Institutions, except collaborating Institutions funded by subaward(s) for which the 30% limit of total budget for all subawards applies. Eligibility Letter must include a list of federally funded projects in the area of QISE received by the Institution in the last 5 years, including award title, award start and end dates, funding source, and total funding amount. The list of projects does not count against the 1 page limit.

The following supplementary documents are required only for Track 2 proposals:

- **List of Personnel**: (maximum 1 page): A list of key personnel involved with a succinct description of what each person uniquely brings to the project and how their expertise is to be integrated with the broad effort.
- **Institutional Sustainability Plan** (maximum 3 pages): Institutional Sustainability Plan must contain:
  - A convincing design for expansion and continuation of QISE efforts at the Institution beyond the award duration, including plans for faculty line development, infrastructure, and resources, matching the Institution's vision of future QISE research effort,
  - Statement confirming readiness to grant release time to faculty if needed for performing duties associated with the award,
  - Partnership plan including vision of collaboration with local industry, government, organizations and other institutions to expand the impact of activities.
  - A timetable of planned activities.

Single Copy Documents.

The following Single Copy Document is required both for Track 1 and Track 2 proposals:

Proposed Reviewers (maximum: 2 pages): Submit a list of individuals who might be "suitable reviewers" to act as impartial reviewers. Include their names, affiliations, phone numbers, e-mail addresses, and areas of expertise. PIs can also designate persons they would prefer not review the proposal, indicating why.

Single Copy Documents are used by NSF staff only and are not available to reviewers.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

No more than 30% of the total award budget can be sub-awarded to non-lead institutions which do not meet the eligibility criteria, as discussed above.

The total materials and small equipment cost in Track 1 proposals cannot exceed 20% of total award budget.

Total materials and equipment costs in Track 2 proposals cannot exceed 35% of proposal budget and must be part of the lead institution's budget and not part of a sub-award.

C. Due Dates

- **Letter of Intent Due Date(s)** *(required)* (due by 5 p.m. submitter's local time):

    April 01, 2022

    > Track 2 proposals

    February 03, 2023

    > Track 2 proposals

- **Full Proposal Deadline(s)** (due by 5 p.m. submitter's local time):

    May 06, 2022

    > Track 2 proposals

    June 03, 2022

    > Track 1 proposals

    March 03, 2023

    > Track 2 proposals

    April 07, 2023

    > Track 1 proposals

D. Research.gov/Grants.gov Requirements

For Proposals Submitted Via Research.gov:

To prepare and submit a proposal via Research.gov, see detailed technical instructions available at: https://www.research.gov/research-portal/appmanager/base/desktop?_nfpb=true&_pageLabel=research_node_display&_nodePath=/researchGov/Service/Desktop/ProposalPreparationandSubmission.html. For Research.gov user support, call the Research.gov Help Desk at 1-800-673-6188 or e-mail rgov@nsf.gov. The Research.gov Help Desk answers general technical questions related to the use of the Research.gov system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

For Proposals Submitted Via Grants.gov:

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: https://www.grants.gov/web/grants/applicants.html. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

Proposers that submitted via Research.gov may use Research.gov to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements, for review. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF either as *ad hoc* reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in PAPPG Exhibit III-1.

A comprehensive description of the Foundation's merit review process is available on the NSF website at: https://www.nsf.gov/bfa/dias/policy/merit_review/.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Leading the World in Discovery and Innovation, STEM Talent Development and the Delivery of Benefits from Research - NSF Strategic Plan for Fiscal Years (FY) 2022 - 2026*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the strategic objectives in support of NSF's mission is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions must recruit, train, and prepare a diverse STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

NSF's mission calls for the broadening of opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

A. Merit Review Principles and Criteria

The National Science Foundation strives to invest in a robust and diverse portfolio of projects that creates new knowledge and enables breakthroughs in understanding across all areas of science and engineering research and education. To identify which projects to support, NSF relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects.

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (PAPPG Chapter II.C.2.d(i). contains additional information for use by proposers in development of the Project Description section of the proposal). Reviewers are strongly encouraged to review the criteria, including PAPPG Chapter II.C.2.d(i), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to
    a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
    b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and other underrepresented groups in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management Plan and the Postdoctoral Researcher Mentoring Plan, as appropriate.

Additional Solicitation Specific Review Criteria

In addition to the two NSF review criteria (intellectual merit and broader impacts), additional criteria will be used in the review of all ExpandQISE proposals:

- **Eligibility**: Is the lead institution eligible as one with only nascent or no prior investment in QISE as described in the eligibility criterion?
- **Participation**: To what extent does the proposal advance the NSF goal of increasing the participation of all members of society in the scientific enterprise?
- **Alignment**: To what extent is the Intellectual Merit of this proposal aligned with at least one of the Focus Areas? To what extent is the proposed workforce development activity aligned with the capacity expansion goals outlined above?
- **Capacity**: Will the proposed efforts lead to an increase in US capacity in the area of QISE by enabling the Lead Institution to develop or expand needed programs, infrastructure and critical mass?
- **External Connection**: Does the proposal contain meaningful leverage of efforts and impacts through close collaboration and cooperation with the external Co-PI, projects, centers and efforts enabled by investments made by NSF, DOE and NIST in the area of QISE?
- **Sustainability** [only in Track 2]: Does the Institutional sustainability Plan offer a clear and convincing path towards increasing capacity, building critical mass and sustainability of efforts beyond the lifetime of the award?

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Panel Review.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will generally be completed and submitted by each reviewer and/or panel. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF strives to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

After programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements or the Division of Acquisition and Cooperative Support for review of business, financial, and policy implications. After an administrative review has occurred, Grants and Agreements Officers perform the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

Once an award or declination decision has been made, Principal Investigators are provided feedback about their proposals. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers or any reviewer-identifying information, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by an NSF Grants and Agreements Officer. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award notice, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award notice; (4) the applicable award conditions, such as Grant General Conditions (GC-1)*; or Research Terms and Conditions* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award notice. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at https://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the NSF *Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

Administrative and National Policy Requirements

Build America, Buy America

As expressed in Executive Order 14005, Ensuring the Future is Made in All of America by All of America's Workers (86 FR 7475), it is the policy of the executive branch to use terms and conditions of Federal financial assistance awards to maximize, consistent with law, the use of goods, products, and materials produced in, and services offered in, the United States.

Consistent with the requirements of the Build America, Buy America Act (Pub. L. 117-58, Division G, Title IX, Subtitle A, November 15, 2021), no funding made available through this funding opportunity may be obligated for an award unless all iron, steel, manufactured products, and construction materials used in the project are produced in the United States. For additional information, visit NSF's Build America, Buy America webpage.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer no later than 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). No later than 120 days following expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report, will delay NSF review and processing of any future funding increments as well as any pending proposals for all identified PIs and co-PIs on a given award. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through Research.gov, for preparation and submission of annual and final project reports. Such reports provide information on accomplishments, project participants (individual and organizational), publications, and other specific products and impacts of the project. Submission of the report via Research.gov constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report also must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

More comprehensive information on NSF Reporting Requirements and other important information on the administration of NSF awards is contained in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

VIII. AGENCY CONTACTS

Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.

General inquiries regarding this program should be made to:

- Tomasz Durakiewicz, MPS, telephone: (703) 292-4892, email: tdurakie@nsf.gov

- John D. Gillaspy, MPS, telephone: (703) 292-7173, email: JGILLASP@nsf.gov

- Luis A. Cubano, EHR, telephone: (703) 292-7941, email: lcubano@nsf.gov

- Abiodun Ilumoka, EHR, telephone: (703) 292-2703, email: ailumoka@nsf.gov

- Vinod K. Lohani, EHR, telephone: (703) 292-2330, email: vlohani@nsf.gov

- Wu He, EHR, telephone: (703) 292-7593, email: wuhe@nsf.gov

- Nadia A. El-Masry, ENG, telephone: (703) 292-4975, email: nelmasry@nsf.gov

- Rosa Lukaszew, ENG, telephone: (703) 292-8103, email: rlukasze@nsf.gov

- Pinaki Mazumder, CISE, telephone: (703) 292-7375, email: pmazumde@nsf.gov

For questions related to the use of FastLane or Research.gov, contact:

- FastLane and Research.gov Help Desk: 1-800-673-6188
- FastLane Help Desk e-mail: fastlane@nsf.gov.
- Research.gov Help Desk e-mail: rgov@nsf.gov

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this website by potential proposers is strongly encouraged. In addition, "NSF Update" is an information-delivery system designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Grants Conferences. Subscribers are informed through e-mail or the user's Web browser each time new publications are issued that match their identified interests. "NSF Update" also is available on NSF's website.

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this mechanism. Further information on Grants.gov may be obtained at https://www.grants.gov.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent Federal agency created by the National Science Foundation Act of 1950, as amended (42 USC 1861-75). The Act states the purpose of the NSF is "to promote the progress of science; [and] to advance the national health, prosperity, and welfare by supporting research and education in all fields of science and engineering."

NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 55,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Arctic and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See the *NSF Proposal & Award Policies & Procedures Guide* Chapter II.E.6 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

> The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.
>
> To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at https://www.nsf.gov
>
> - **Location:**   2415 Eisenhower Avenue, Alexandria, VA 22314
>
> - **For General Information**   (703) 292-5111
>   (NSF Information Center)**:**
>
> - **TDD (for the hearing-impaired):**   (703) 292-5090
>
> - **To Order Publications or Forms:**

Send an e-mail to:	nsfpubs@nsf.gov	
or telephone:	(703) 292-8134	
● **To Locate NSF Employees:**	(703) 292-5111	

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See System of Record Notices, NSF-50, "Principal Investigator/Proposal File and Associated Records," and NSF-51, "Reviewer/Proposal File and Associated Records." Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

Suzanne H. Plimpton
Reports Clearance Officer
Policy Office, Division of Institution and Award Support
Office of Budget, Finance, and Award Management
National Science Foundation
Alexandria, VA 22314

| Policies and Important Links | | Privacy | | FOIA | | Help | | Contact NSF | | Contact Web Master | | SiteMap |

National Science Foundation, 2415 Eisenhower Avenue, Alexandria, Virginia 22314, USA
Tel: (703) 292-5111, FIRS: (800) 877-8339 | TDD: (703) 292-5090 or (800) 281-8749

Text Only