

NSF 24-604: Ethical and Responsible Research (ER2)

Program Solicitation

Document Information

Document History

- **Posted:** September 5, 2024
- **Replaces:** [NSF 23-630](#)

[View the program page](#)



U.S. National Science Foundation

Directorate for Social, Behavioral and Economic Sciences

SBE Office of Multidisciplinary Activities

Office of International Science and Engineering

Directorate for Biological Sciences

Directorate for Computer and Information Science and Engineering

Directorate for Engineering

Directorate for Geosciences

Directorate for Mathematical and Physical Sciences

Directorate for STEM Education

Directorate for Technology, Innovation and Partnerships

Full Proposal Target Date(s):

January 23, 2025

Fourth Thursday in January, Annually Thereafter



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Important Information And Revision Notes

The solicitation has been updated to remove the requirement for a Mentoring Student Researchers section in the Project Description, update the types of research questions of interest to the program, replace the Institutional Transformation Project proposal type with the Partnership for Transformational Research (PTR) Project proposal type, and add the requirement that each PTR proposal include a Project Management Plan (PMP) as a supplementary document.

Important Information

The ER2 program does not normally consider proposals that focus on medical education or medical research. Questions about the topical scope of the ER2 program should be directed to the program officers listed in this solicitation.

Any proposal submitted in response to this solicitation should be submitted in accordance with the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) that is in effect for the relevant due date to which the proposal is being submitted. The NSF PAPPG is regularly revised and it is the responsibility of the proposer to ensure that the proposal meets the requirements specified in this solicitation and the applicable version of the PAPPG. Submitting a proposal prior to a specified deadline does not negate this requirement.

Summary Of Program Requirements

General Information

Program Title:

Ethical and Responsible Research (ER2)

Synopsis of Program:

The ER2 program supports projects that focus on what constitutes or promotes responsible and ethical research in science, technology, engineering, and mathematics (STEM) fields. The ER2 program promotes the development, improvement, and dissemination of responsible and ethical research practices and aims to build on organizational cultures that value and reward such practices. Proposers to the ER2 program may examine responsible and ethical research practices across one or more career stages. This can include, for example, the research practices of students, postdoctoral fellows, faculty, or practitioners. ER2

projects could seek to improve responsible and ethical research practices in teams, organizations, or communities, or between researchers and the public. ER2 projects may include the development of interventions that promote responsible and ethical research practices, including in multidisciplinary, inter-organizational, cross-sector, translational, or international contexts. An ER2 project can also identify challenges that undermine or erode responsible and ethical research practices in STEM fields and evaluate measures to prevent or mitigate such challenges. A comprehensive approach to responsible and ethical research not only influences individual behavior, but it also contributes to an inclusive, equitable, and respectful research culture. Thus, proposers could examine organizational or other factors that positively influence responsible and ethical research practices in STEM fields.

Proposals from or involving substantial collaboration with organizations in [EPSCoR-eligible jurisdictions](#), [minority-serving institutions](#), women's colleges, or organizations primarily serving persons with disabilities are encouraged. Proposals that include international collaborations are encouraged if the unique resources, expertise, facilities, or locations of international partners enhance the merit of the proposed work. Please see the [NSF PAPPG](#) for guidance on international collaborations.

Broadening Participation In Stem:

NSF recognizes the unique lived experiences of individuals from communities that are underrepresented and/or underserved in science, technology, engineering, and mathematics (STEM) and the barriers to inclusion and access to STEM education and careers. NSF highly encourages the leadership, partnership, and contributions in all NSF opportunities of individuals who are members of such communities supported by NSF. This includes leading and designing STEM research and education proposals for funding; serving as peer reviewers, advisory committee members, and/or committee of visitor members; and serving as NSF leadership, program, and/or administrative staff. NSF also highly encourages demographically diverse institutions of higher education (IHEs) to lead, partner, and contribute to NSF opportunities on behalf of their research and education communities. NSF expects that all individuals, including those who are members of groups that are underrepresented and/or underserved in STEM, are treated equitably and inclusively in the Foundation's proposal and award process.

NSF encourages IHEs that enroll, educate, graduate, and employ individuals who are members of groups underrepresented and/or underserved in STEM education programs and careers to lead, partner, and contribute to NSF opportunities, including leading and designing STEM research and education proposals for funding. Such IHEs include, but may not be limited to, community colleges and two-year institutions, mission-based institutions such as Historically Black Colleges and Universities (HBCUs), Tribal Colleges and Universities (TCUs), women's colleges, and institutions that primarily serve persons with disabilities, as well as institutions defined by enrollment such as Predominantly Undergraduate Institutions (PUIs), Minority-Serving Institutions (MSIs), and Hispanic Serving Institutions (HSIs).

"Broadening participation in STEM" is the comprehensive phrase used by NSF to refer to the Foundation's goal of increasing the representation and diversity of individuals, organizations, and geographic regions that contribute to STEM teaching, research, and innovation. To broaden participation in STEM, it is necessary to address issues of equity, inclusion, and access in STEM education, training, and careers. Whereas all NSF programs might support broadening participation components, some programs primarily focus on supporting broadening participation research and projects. Examples can be found on the NSF [Broadening Participation in STEM](#) website.

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.

- Jason Borenstein (SBE), Program Director, SBE/SMA, telephone: (703) 292-4207, email: jborenst@nsf.gov
- Wenda Bauchspies (SBE), Program Director, SBE/SES, telephone: (703) 292-5034, email: wbauchsp@nsf.gov
- Cindy Bethel (CISE), Program Director, CISE/IIS, telephone: (703) 292-4420, email: cbethel@nsf.gov

- Daniel Denecke (EDU), Program Director, EDU/DGE, telephone: (703) 292-8072, email: ddenecke@nsf.gov
- Alice L. Pawley (ENG), Program Director, ENG/EEC, telephone: (703) 292-7286, email: apawley@nsf.gov
- Allen J. Pope (OISE), Program Director, OD/OISE, telephone: (703) 292-8030, email: apope@nsf.gov
- George Richter-Addo (MPS), Program Director, MPS/CHE, telephone: (703) 292-7528, email: griechter@nsf.gov
- Elizabeth L. Rom (GEO), Program Director, GEO/RISE, telephone: (703) 292-7709, email: elrom@nsf.gov
- Danielle F. Sumy (TIP), Program Director, TIP/ITE, telephone: (703) 292-4217, email: dsumy@nsf.gov
- Edda Thiels (BIO), Program Director, BIO/IOS, telephone: (703) 292-8421, email: ethiels@nsf.gov
- Bela Jang (SBE), Program Specialist, telephone: (703) 292-7902, email: bejang@nsf.gov

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

- 47.041 --- Engineering
- 47.049 --- Mathematical and Physical Sciences
- 47.050 --- Geosciences
- 47.070 --- Computer and Information Science and Engineering
- 47.074 --- Biological Sciences
- 47.075 --- Social Behavioral and Economic Sciences
- 47.076 --- STEM Education
- 47.079 --- Office of International Science and Engineering
- 47.083 --- Office of Integrative Activities (OIA)
- 47.084 --- NSF Technology, Innovation and Partnerships

Award Information

Anticipated Type of Award: Standard Grant

Estimated Number of Awards: 10 to 15

Anticipated Funding Amount: \$5,400,000

This solicitation will consider proposals for four types of projects:

- **Conference Projects** with a total maximum budget of \$50,000 and a duration of up to 12 months.
- **Incubation Projects** with a total maximum budget of \$100,000 and a duration of up to 12 months.
- **Standard Research Projects** with a total maximum budget of \$400,000 and a duration of up to 3 years.
- **Partnership for Transformational Research Projects** with a total maximum budget of \$700,000 and a duration of up to 4 years.

Project durations and budgets must be commensurate with the scope of the work proposed and with guidance provided elsewhere in this solicitation regarding anticipated program resources. NSF anticipates a portfolio of awards with a range of budgets and durations up to the maximum amount.

Estimated program budget, number of awards, and average award size/duration are subject to the availability of funds.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- Non-profit, non-academic organizations: Independent museums, observatories, research laboratories, professional societies and similar organizations located in the U.S. that are directly associated with educational or research activities.

Who May Serve as PI:

The leadership of project teams are expected to have expertise in the STEM areas or fields on which the project focuses, and in ethics, values, evaluation, or pedagogy. For a Partnership for Transformational Research Project proposal, it is highly recommended that at least one senior member of the administration from each partnering organization serve as part of the research team's leadership.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or co-PI: 2

An individual may appear as PI, co-PI, or Senior/Key Personnel on no more than two proposals submitted in response to this solicitation.

In the event that an individual exceeds this limit, the first two proposals received prior to the target date will be evaluated by the program for review, and the remainder of the individual's proposals will be returned without review. **No exceptions to this rule will be made.**

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **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

- **Full Proposal Target Date(s):**

January 23, 2025

Fourth Thursday in January, Annually Thereafter

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:

Additional award conditions apply. Please see the full text of this solicitation for further information.

Reporting Requirements:

Standard NSF reporting requirements apply.

I. Introduction

In August of 2017, the NSF Director sent a notice to universities, colleges and other NSF grantee organizations reiterating NSF's requirement, in accordance with Section 7009 of the [America COMPETES Act \(H.R. 2272\)](#), that each organization must "...provide appropriate training and oversight in the ethical conduct of research to all undergraduates, graduate students, and postdoctoral researchers who will be supported by NSF to conduct research" and "...improve strategies for fostering research integrity." The [CHIPS and Science Act of 2022 \(PUBLIC LAW 117-167\)](#) modified NSF's responsible and ethical conduct of research (RECR) training and oversight requirements to include "...faculty and other senior personnel who will be supported by NSF to conduct research." Outcomes from the Ethical and Responsible Research (ER2) program contribute to the knowledge base on what constitutes or promotes responsible and ethical research practices, which can inform the implementation of these federal laws.

II. Program Description

The ER2 program supports projects that focus on what constitutes or promotes responsible and ethical research in STEM fields. The ER2 program promotes the development, improvement, and dissemination of responsible and ethical research practices and aims to build on organizational cultures that value and reward such practices. Proposers to the ER2 program may examine responsible and ethical research practices across one or more career stages. This can include, for example, the research practices of students, postdoctoral fellows, faculty, or practitioners. ER2 projects seek to improve responsible and ethical STEM research practices in teams, organizations, or communities, or between researchers and the public. ER2 projects can include the development of interventions that promote responsible and ethical research practices, including in multidisciplinary, inter-organizational, cross-sector, translational or international contexts. An ER2

project could also identify challenges that undermine or erode responsible and ethical research practices in STEM fields and evaluate measures to prevent or mitigate such challenges. A comprehensive approach to responsible and ethical research not only influences individual behavior, but it also contributes to an inclusive, equitable, and respectful research culture. Thus, proposers could examine organizational or other factors that positively influence responsible and ethical research practices in STEM fields.

Research questions of interest to the program include but are not limited to:


- What constitutes responsible and ethical research practice in STEM and why?
- Which strategies promote effective mentoring, and foster inclusive, equitable, and respectful research environments?
- Which organizational practices positively promote responsible and ethical research, and how can these practices be translated and integrated into other settings?
- What are responsible and ethical approaches to co-designing research activities? This could, for example, involve a research partnership with a local community organization, industry, an Indigenous population, or a group historically underrepresented in STEM.
- What are similarities and differences in responsible and ethical research practices across different STEM fields or sectors (for example, academia, industry and non-profit), and what can these fields or sectors learn from one another about such practices?
- How does the use of technology such as artificial intelligence inform or change responsible and ethical research practices in STEM? For example, how could technology impact the ethics of knowledge discovery, authorship, communicating research findings, or data management, or the responsibilities that researchers have to the public?
- Which approaches enable STEM researchers to engage with the public responsibly or design their research activities in a way that fosters the well-being of the public?

ER2 projects can include qualitative, quantitative, or mixed methods approaches. When working with partners such as local, regional, national, or international communities, the ER2 program expects project teams to treat each partner equitably and respectfully. This could, for example, involve upholding best practices for co-creating knowledge and sharing research findings with each partner.

A proposal submitted to the ER2 program must intersect with one or more of the following STEM areas or fields that NSF supports:





- Social, Behavioral and Economic Sciences
- Biological Sciences
- Computer and Information Science and Engineering
- Engineering
- Geosciences
- Mathematical and Physical Sciences
- STEM Education
- Technology, Innovation and Partnerships
- International Science and Engineering

For examples of research topics of interest to the ER2 program in these STEM areas or fields, refer to the **Additional program resources** section on the [ER2 Program homepage](#).

Proposals should specify plans to share project findings with appropriate research and educational communities and to serve as a resource for such communities. In addition, ER2 award recipients must submit project deliverables such as ethics case studies, modules, and instructor materials to the [Online Ethics Center for Engineering and Science](#)  (OEC)

and share findings at biennial ER2 PI meetings. The PI meetings may alternate between in-person and virtual formats. ER2 award recipients are responsible for covering their expenses of participating in the PI meetings throughout the duration of their award and must include these costs in the proposed budget. Any costs associated with uploading content to the OEC should also be included in the proposed budget.

In addition to publications housed within NSF's Public Access Repository, many of the ethics materials developed through projects supported by the ER2 program are located at one or more of the following:

1. Ethics Education Library, [Center for Study of Ethics in the Professions](#) , Illinois Institute of Technology
2. [IDEESE: International Dimensions of Ethics Education in Science & Engineering](#) , University of Massachusetts Amherst
3. [National Center for Principled Leadership & Research Ethics](#) , University of Illinois Urbana-Champaign
4. [Online Ethics Center for Engineering and Science](#)  (OEC), University of Virginia

The ethics resource centers in the above list have received funding from NSF. Some of the materials available through these centers focus on discipline-specific ethical issues whereas others are aimed at broader issues that are common across STEM fields.

TYPES OF PROPOSALS

Conference Projects

The ER2 program supports conferences designed to bring together researchers and other stakeholders, especially those who have not partnered previously, to foster new research, identify emerging challenges and opportunities, or develop new standards on responsible and ethical research practices within STEM communities. The ER2 program does not support gatherings whose primary purpose is to share the results of completed research. The ER2 program encourages proposers to describe plans for including students and members of historically underrepresented groups as active conference participants. Conference proposals should generally be submitted a year in advance of the proposed event.

Conference proposals may be reviewed at any time, but proposers are encouraged to submit no later than the target date for this solicitation. A proposal of this type must include "Conference" within its title. For general guidance about conferences, including a list of required elements and budget exclusions, follow the PAPPG guidance for preparing Conference Proposals (PAPPG Chapter II.F).

Budget Guidelines for Conference Projects

A proposal for an ER2 Conference Project should typically request a budget of no more than \$50,000 in total costs and a duration of up to 1 year. The ER2 program will consider requests for conferences that exceed this amount only in special circumstances.

Incubation Projects

Incubation Projects enable research teams across multiple organizations to collaborate to develop and later submit an ER2 Standard Research or Partnership for Transformational Research proposal. An Incubation Project must span at least two organizations. The project may involve a pilot study and/or a workshop as a component of the incubation activities.

Those who intend to submit an Incubation Project proposal should consult with an ER2 program officer before submitting to ascertain the suitability of the envisioned activity. A proposal of this type must include "Incubation Project" within its title.

Budget Guidelines for Incubation Projects

A proposal for an ER2 Incubation Project can request a total maximum budget of \$100,000 and a duration of up to 1 year.

Standard Research Projects

Standard Research Projects should produce new knowledge about what fosters responsible and ethical research practices in one or more STEM fields. Standard Research Project proposals can be collaborative.

Budget Guidelines for Standard Research Projects

A proposal for an ER2 Standard Research Project can request a total maximum budget of \$400,000 and a duration of up to 3 years.

Partnership for Transformational Research (PTR) Projects

Partnership for Transformational Research Projects are designed to support the development, implementation, and evaluation of innovative strategies that promote responsible and ethical research practices within a partnership of two or more organizations. PTR Projects should contribute to the knowledge base of what fosters responsible and ethical practices in STEM research communities and serve as a catalyst for embedding such practices at each of the partner organizations. It is highly recommended that at least one senior member of the administration from each partnering organization serve as part of the research team's leadership. PTR Projects can be submitted either as separately submitted collaborative proposals or a single proposal with subawards. A proposal of this type must include "Partnership for Transformational Research" within its title.

Budget Guidelines for Partnership for Transformational Research Projects

A proposal for an ER2 Partnership for Transformational Project can request a total budget of up to \$700,000 and a maximum duration of 4 years.

III. Award Information

Anticipated Type of Award: Standard Grant

Estimated Number of Awards: 10-15

Anticipated Funding Amount: \$5,400,000

Estimated total annual funding amount is \$5,400,000 subject to the availability of funds. The maximum amount for 4-year awards is \$700,000 (including indirect costs), and the maximum amount for 3-year awards is \$400,000 (including indirect costs).

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds.

IV. Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- Non-profit, non-academic organizations: Independent museums, observatories, research laboratories, professional societies and similar organizations located in the U.S. that are directly associated with educational or research activities.

Who May Serve as PI:

The leadership of project teams are expected to have expertise in the STEM areas or fields on which the project focuses, and in ethics, values, evaluation, or pedagogy. For a Partnership for Transformational Research Project proposal, it is highly recommended that at least one senior member of the administration from each partnering organization serve as part of the research team's leadership.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or co-PI: 2

An individual may appear as PI, co-PI, or Senior/Key Personnel on no more than two proposals submitted in response to this solicitation.

In the event that an individual exceeds this limit, the first two proposals received prior to the target date will be evaluated by the program for review, and the remainder of the individual's proposals will be returned without review. **No exceptions to this rule will be made.**

Additional Eligibility Info:

Other types of organizations who are eligible to submit to NSF can participate as part of an ER2 proposal as a collaborating or subawardee organization as long as they do not serve as the lead organization.

Proposals from or involving substantial collaboration with organizations in EPSCoR-eligible jurisdictions, minority-serving institutions, women's colleges or organizations primarily serving persons with disabilities are encouraged. Proposals that include international collaborations are encouraged if the unique resources, expertise, facilities or locations of international partners enhance the merit of the proposed work. Please see the NSF PAPPG for guidance on international collaborations.

V. Proposal Preparation And Submission Instructions

A. Proposal Preparation Instructions

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.

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via Research.gov. PAPPG Chapter II.E.3 provides additional information on collaborative proposals.

See PAPPG Chapter II.D.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.

Each Partnership for Transformational Research Project proposal must include a **Project Management Plan** (PMP) as a supplementary document. The PMP can be a maximum of two pages. The PMP must include a description of the specific roles and responsibilities of the PIs, co-PIs, and other personnel who are part of the leadership, coordination, design, and/or assessment of the project. The PMP must describe the governance structure of the research team, and how the research team will ensure consistent and effective communication among its members and across the partner organizations. A PTR proposal that does not include a Project Management Plan will be returned without review.

Please refer to Section II, Program Description, for special proposal preparation information and instructions.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

Other budgetary limitations apply. Please see the full text of this solicitation (Sections V.B and VII.B) for further information.

C. Due Dates

- **Full Proposal Target Date(s):**

January 23, 2025

Fourth Thursday in January, Annually Thereafter

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/ProposalPreparationan

For Research.gov user support, call the Research.gov Help Desk at 1-800-381-1532 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/applicants>. 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 Research.gov for further processing.

The NSF [Grants.gov Proposal Processing in Research.gov informational page](#) provides submission guidance to applicants and links to helpful resources including the NSF [Grants.gov Application Guide](#), [Grants.gov Proposal Processing in Research.gov how-to guide](#), and [Grants.gov Submitted Proposals Frequently Asked Questions](#). Grants.gov proposals must pass all NSF pre-check and post-check validations in order to be accepted by Research.gov at NSF.

When submitting via Grants.gov, NSF strongly recommends applicants initiate proposal submission at least five business days in advance of a deadline to allow adequate time to address NSF compliance errors and resubmissions by 5:00 p.m. submitting organization's local time on the deadline. Please note that some errors cannot be corrected in Grants.gov. Once a proposal passes pre-checks but fails any post-check, an applicant can only correct and submit the in-progress proposal in Research.gov.

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.D.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.D.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 plan 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 and Sharing Plan and the Mentoring Plan, as appropriate.

Additional Solicitation Specific Review Criteria

The following additional review criteria are given for Partnership for Transformational Research Project proposals:

1. To what degree does the proposal include well-formulated and feasible plans for evaluating the effectiveness of the proposed partnership and transformational activities?
2. To what degree does the proposal describe mechanisms to ensure the long-term impact and sustainability of the partnership and transformational activities?
3. To what degree does the Project Management Plan indicate that the research team has clearly assigned roles, is well-organized, and is likely to accomplish project goals?

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review, or Internal NSF Review.

Review Method:

- Ad Hoc
- Panel Review
- Internal NSF 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 proposers whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new recipients 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 infrastructure projects under 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.

Special Award Conditions:

Standard NSF award conditions apply.

In addition, ER2 award recipients must submit project deliverables such as ethics case studies, modules and instructor materials to the [Online Ethics](#) [Center for Engineering and Science](#) (OEC). Any costs associated with uploading content to the OEC should be included in the proposed budget. ER2 award recipients are also expected to share project findings at biennial ER2 PI meetings. The PI meetings may alternate between in-person and virtual formats. ER2 award recipients are responsible for covering the expenses of participating in the PI meetings throughout the duration of their award and must include these costs in the proposed budget.

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 annual project report, and a project outcomes report for the general public.

Failure to provide the required annual or final annual 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 annual 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:

- Jason Borenstein (SBE), Program Director, SBE/SMA, telephone: (703) 292-4207, email: jborenst@nsf.gov
- Wenda Bauchspies (SBE), Program Director, SBE/SES, telephone: (703) 292-5034, email: wbauchsp@nsf.gov
- Cindy Bethel (CISE), Program Director, CISE/IIS, telephone: (703) 292-4420, email: cbethel@nsf.gov
- Daniel Denecke (EDU), Program Director, EDU/DGE, telephone: (703) 292-8072, email: ddenecke@nsf.gov
- Alice L. Pawley (ENG), Program Director, ENG/EEC, telephone: (703) 292-7286, email: apawley@nsf.gov
- Allen J. Pope (OISE), Program Director, OD/OISE, telephone: (703) 292-8030, email: apope@nsf.gov
- George Richter-Addo (MPS), Program Director, MPS/CHE, telephone: (703) 292-7528, email: griechter@nsf.gov
- Elizabeth L. Rom (GEO), Program Director, GEO/RISE, telephone: (703) 292-7709, email: elrom@nsf.gov
- Danielle F. Sumy (TIP), Program Director, TIP/ITE, telephone: (703) 292-4217, email: dsumy@nsf.gov
- Edda Thiels (BIO), Program Director, BIO/IOS, telephone: (703) 292-8421, email: ethiels@nsf.gov
- Bela Jang (SBE), Program Specialist, telephone: (703) 292-7902, email: bejang@nsf.gov

For questions related to the use of NSF systems contact:

- NSF Help Desk: 1-800-381-1532
- 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 (FASSED) 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.F.7 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** (NSF Information Center): (703) 292-5111
- **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 proposers 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 proposers 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
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