

NSF Trailblazer Engineering Impact Award (TRAILBLAZER)

PROGRAM SOLICITATION

NSF 23-629



National Science Foundation
Directorate for Engineering
Emerging Frontiers and Multidisciplinary Activities

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

February 15, 2024

IMPORTANT INFORMATION AND REVISION NOTES

Prospective PIs interested in submitting a TRAILBLAZER proposal must contact the Office of Emerging Frontiers and Multidisciplinary Activities (EFMA) via the Program Suitability and Proposal Concept Tool (ProSPCT) webform at <https://suitability.nsf.gov/s/> by November 9th, 2023. Refer to Section V. Proposal Preparation and Submission Instructions for further details.

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:

NSF Trailblazer Engineering Impact Award (Trailblazer)

Synopsis of Program:

The NSF Trailblazer Engineering Impact Award (TRAILBLAZER) program supports individual engineers and scientists who propose novel research projects with the potential to innovatively and creatively address major societal challenges, advance US leadership, and catalyze the convergence of engineering and science domains. The TRAILBLAZER program emphasizes the qualities of the investigator that illustrate they can conceive of and support transformative research projects and make major contributions toward solving significant research problems. TRAILBLAZER will support engineers and scientists with excellent records of innovation and creativity with successful outcomes to pursue new research directions.

All funded TRAILBLAZER projects will form an NSF TRAILBLAZER cohort and investigators will be required to attend an annual PI meeting and may be invited to other activities.

INFORMATIONAL WEBINAR: The Emerging Frontiers and Multidisciplinary Activities (EFMA) Office will host an informational webinar in October 2023 to discuss the TRAILBLAZER program and answer questions about the FY 2024 solicitation. Details on how to join this webinar will be posted on the Directorate for Engineering and EFMA Websites.

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.

- TRAILBLAZER Program, telephone: N/A, email: TRAILBLAZER@nsf.gov
- Alias Smith, telephone: (703) 292-8367, email: alismith@nsf.gov

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

- 47.041 --- Engineering

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 5

The anticipated budget for this program solicitation is \$15,000,000 in FY 2024, pending the availability of funds. Each award will be funded as a Standard Grant or Continuing Grant. The Program anticipates making a minimum of 5 awards. Each project may receive support of up to a total of \$3,000,000 over three years.

Anticipated Funding Amount: \$15,000,000

Pending the availability of funds

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- 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.
- 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.

Who May Serve as PI:

The PI must hold a tenured or tenure-eligible faculty appointment at the Associate or Full Professor rank or equivalent at an organization that is eligible to submit as described under "Who May Submit Proposals." Additionally, the PI must have an appointment in an Engineering School or College and/or have earned an Engineering Doctorate degree. If the proposal is submitted by a non-profit, non-academic organization, the PI must meet the following requirements: (1) the PI has a continuing appointment that is expected to last the 3 years of a TRAILBLAZER award; and (2) the appointment has substantial research responsibilities.

Only single PI TRAILBLAZER proposals will be accepted in response to this solicitation. Collaborative proposals, as described in PAPPG Chapter II.E.3.a. and II.E.3.b, are not allowed. Any proposal submitted with subawards, or as separate submissions from multiple organizations, will be returned without review.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

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

An eligible Principal Investigator may submit only one TRAILBLAZER proposal in response to this solicitation. If an individual is listed as PI on more than one proposal submitted in response to this solicitation, all proposals submitted after the first one will be returned without review. No co-PIs are permitted.

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:**

Not Applicable

C. Due Dates

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

February 15, 2024

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.

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I. INTRODUCTION

The Emerging Frontiers and Multidisciplinary Activities (EFMA) Office in the Directorate for Engineering provides funding opportunities for researchers to advance the frontiers of fundamental engineering research. The EFMA office supports the Emerging Frontiers in Research and Innovation (EFRI) program, which provides critical, strategic support of fundamental discovery at the leading edges of engineering research and

education. The EFRI program invests in research teams that show a high potential to contribute to new areas of fundamental or applied research, catalyze development of new industries or capabilities that increase the leadership position for the country, and/or make significant progress towards addressing a national need or grand challenge.

The NSF Trailblazer Engineering Impact Award (TRAILBLAZER) program will advance the EFRI program by supporting individual innovative and creative engineers to conduct research in emerging engineering frontiers, not limited to the topics currently and previously supported by the EFRI program. For the program to support the best possible researchers and research projects, individuals that meet the PI eligibility criteria from diverse backgrounds and from the full spectrum of eligible institutions in all geographic locations are strongly encouraged to submit to this solicitation.

The TRAILBLAZER program will support individual engineers and scientists that demonstrate a capacity for research excellence and creativity to undertake novel research projects that have the potential to innovatively address major societal challenge(s), advance US leadership, and/or catalyze the convergence of engineering and science domains. TRAILBLAZER PIs are expected to convene and lead an effective team to conduct the proposed research activities. These teams are developed after the award and not at the time of proposal submission. The proposed projects are anticipated to generate novel solutions to grand challenge(s), fundamental new insights, and/or pioneering technological advances. Proposed projects may involve exceptionally innovative approaches and/or radically unconventional hypotheses. TRAILBLAZER is not intended to expand a current research program into the proposed area of research. Projects that are extensions of ongoing or previous research are not eligible.

II. PROGRAM DESCRIPTION

The TRAILBLAZER program supports individual engineering researchers to undertake projects that have the potential to address new areas of fundamental research related to grand challenges and/or national needs, advance US global leadership, and/or catalyze the convergence of engineering and science domains. The TRAILBLAZER program emphasizes the qualities of the investigator which illustrate they can design and lead potentially transformative research projects and make major contributions toward solving significant research problems. The principal investigator must have a track record of success and impact in an area of engineering research. The proposed projects should focus on bold, innovative, and potentially risky approaches to address problems that may seem intractable. The proposed research must hold potential for transformative outcomes, address a national need or grand challenge, and offer a clear leadership role for Engineering.

Research topics of interest should be relevant to the broad mission of NSF. TRAILBLAZER will consider proposals from researchers who propose projects that have the potential for unusually broad impact in engineering research and education, that stimulate development of emerging technologies, that imagine novel investigative tools, and that realize the convergence of engineering and science domains.

The TRAILBLAZER proposal does not require a detailed experimental plan or preliminary data. Review of the proposal will focus on the investigator's history of being a creative and innovative researcher and the suitability of the proposed project for the TRAILBLAZER program.

III. AWARD INFORMATION

The anticipated budget for this program solicitation is \$15,000,000 in FY 2024, pending the availability of funds. Each award will be funded as a Standard Grant or Continuing Grant. The Program anticipates making a minimum of 5 awards. Each project may receive support of up to a total of \$3,000,000 over three years.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- 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.
- 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.

Who May Serve as PI:

The PI must hold a tenured or tenure-eligible faculty appointment at the Associate or Full Professor rank or equivalent at an organization that is eligible to submit as described under "Who May Submit Proposals." Additionally, the PI must have an appointment in an Engineering School or College and/or have earned an Engineering Doctorate degree. If the proposal is submitted by a non-profit, non-academic organization, the PI must meet the following requirements: (1) the PI has a continuing appointment that is expected to last the 3 years of a TRAILBLAZER award; and (2) the appointment has substantial research responsibilities.

Only single PI TRAILBLAZER proposals will be accepted in response to this solicitation. Collaborative proposals, as described in

PAPPG Chapter II.E.3.a. and II.E.3.b. are not allowed. Any proposal submitted with subawards, or as separate submissions from multiple organizations, will be returned without review.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

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

An eligible Principal Investigator may submit only one TRAILBLAZER proposal in response to this solicitation. If an individual is listed as PI on more than one proposal submitted in response to this solicitation, all proposals submitted after the first one will be returned without review. No co-PIs are permitted.

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.

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.

Concept Outline Instructions

Each prospective Principal Investigator (PI) interested in submitting a TRAILBLAZER proposal must contact the Office of Emerging Frontiers and Multidisciplinary Activities (EFMA) via the Program Suitability and Proposal Concept Tool (ProSPCT) webform at <https://suitability.nsf.gov/s/> by November 9th, 2023. To get started, users are required to provide their Login.gov credentials and then complete and submit the Concept Outline form. The Concept Outline provides NSF with summary information:

- PI general information;
- Research Project Keywords;
- Concept Outline Narrative text box (6,000 character count limit): Provide a narrative describing evidence of the PI's eligibility, history of research excellence, brief summary of the proposed project, and description of project's suitability to the TRAILBLAZER program. TRAILBLAZER program suitability criteria include that the project is not an extension of past or current research, project shows potential innovative and transformative impacts, and the proposed research is more suited to the TRAILBLAZER program than to an NSF core program;
- In the Fit to Proposed Proposal Type text box enter "N/A"

Concept Outlines will be evaluated internally by NSF Program Directors for programmatic responsiveness and suitability to the TRAILBLAZER program, as described above. Prospective PIs will receive an email from the cognizant NSF program officer that specifies whether a full proposal may be submitted. The email confirming approval to submit a TRAILBLAZER proposal must be uploaded by the prospective PI as a Supplementary Document as a component of proposal submission. Full proposals submitted without the requisite "Program Officer Concurrence Email" supplementary document will be returned without review.

Full Proposal Instructions

The following instructions supplement or deviate from the guidance in the PAPPG.

Only single PI TRAILBLAZER proposals will be accepted in response to this solicitation. Collaborative proposals, as described in PAPPG Chapter II.E.3.a. and II.E.3.b, are not allowed. Any proposal submitted with subawards, or as separate submissions from multiple organizations, will be returned without review.

Title of Proposed Project: The title for the proposed TRAILBLAZER project must begin with "TRAILBLAZER ". The title must state clearly and succinctly the research and innovation that is the focus for the project.

Project Summary (one-page limit):

- In the **intellectual merit** section include a summary of evidence of investigator-led innovative activities, the nature of the proposed research, and the significant leap or paradigm shift in fundamental engineering knowledge; and
- In the **broader impacts** section, include the potential long-term impact on a grand challenge. Include a summary of the Broadening Participation Plan.

Project Description (maximum 15 pages) must include the subsections listed below. Please see instructions below for providing Results from Prior NSF Support as a Supplementary Document.

- **Intellectual Merit:**
 - *Evidence of Research Excellence and Innovation:* Provide evidence for the PI's capacity for research excellence, creativity, and impactful innovations (i.e., an inclination to question paradigms; a willingness to work with intellectual uncertainties; persistence in the face of failure; ability to work collaboratively and convergently across diverse disciplines; demonstrated ability to support inter- and/or multidisciplinary teams).
 - *Research Approach and Research Plan:* Describe how the proposed research reflects a fundamental new insight, and whether it involves the development of innovative and creative approaches and/or the posing of radically unconventional hypotheses; these should not be logical extensions or scale-up of ongoing or prior research efforts. Describe the vision and goals of the proposed research, approaches, and methodologies to attain the goals, the expected outcomes, and the ethical, legal, and social implications of the proposed research, as appropriate. The TRAILBLAZER program does not request preliminary data or detailed experimental plans; however, reviewers must still be able to ascertain a clear sense of the overall research to be pursued in a robust and rigorous manner.
 - *TRAILBLAZER Suitability:* Describe how the planned research satisfies the stated TRAILBLAZER goals (i.e., address a national need or grand challenge, advance US leadership; demonstrate convergence of engineering and science domains; show innovative and transformative impacts). Describe why the proposed research is suited to the TRAILBLAZER program rather than to an NSF core program.
 - *Distinction from Current and Previous Research:* Provide a description of how this new area of research is distinct from other work of the PI. TRAILBLAZER is not intended to expand the PI's previous or current research into the proposed area of research. Projects that are extensions of the PI's ongoing or previous research are not eligible under this program.
 - *Management plan:* Describe how a strong and effective team will be convened and led by the PI to conduct the proposed research, including team member expertise, team development, means of communication, management of personnel within the project group, management of intellectual property resulting from the project, and timeline of activities. While potential team members may be named, letters of support and team member Biographical Sketches are not permitted.
- **Broader Impacts:** Please follow the guidance provided in the PAPPG to prepare the Broader Impacts section. As a reminder, this must be a separate section labeled "Broader Impacts." The following solicitation-specific information should also be included:
 - The Broader Impacts section should discuss how the proposed project will lead to a significant shift in fundamental engineering knowledge and will have strong long-term potential for significant impact on a grand challenge.
 - The Broader Impacts section should also describe ways in which education, outreach, and community engagement are integrated within the research program to effectively achieve societal impact.
 - The Directorate for Engineering (ENG) promotes diversity in all aspects of its programs. In keeping with ENG's priority to broaden the participation and inclusion of the full spectrum of diverse talents in engineering, the Office of Emerging Frontiers and Multidisciplinary Activities (EFMA) is addressing the need to support diversity in all fields of engineering by requiring all TRAILBLAZER projects to include a **Broadening Participation Plan** as part of the TRAILBLAZER 2024 Solicitation. This requirement will not only promote diversity and inclusion in the human resources engaged in TRAILBLAZER projects but will also expand diversity of thought, ideas, impact, and approaches to define and solve important questions in TRAILBLAZER research. The Broadening Participation Plan must be described as part of Broader Impacts of the proposal both in the Project Summary and in the Project Description. The PI is encouraged to focus on community building, innovative and inclusive engineering practices, advancing engineering talent, diversifying pathways to and through engineering, and addressing the equity, access, and inclusion considerations. The EFMA Office encourages proposers to be creative in the planning of activities to attract and retain persons from the full spectrum of diverse talents to the fields of engineering and engineering research when developing their Broadening Participation Plans.

References Cited: Indicate with an asterisk any cited publications that resulted from prior research funded by NSF for the PI.

Budget: A budget and a budget justification are required. Funds may be requested for personnel, supplies, equipment, and other allowable costs. If a proposal is to be recommended for an award, the NSF TRAILBLAZER Program Directors will negotiate a more detailed budget with the PI prior to award recommendation. Because a **significant commitment of PI time is expected, PIs may request more than two months of salary support.** TRAILBLAZER PIs may commit more than 2 person months per year, up to six months of salary support in a given year. Consistent with PAPPG Chapter II.D.2 regarding NSF's Senior Personnel Salaries & Wages Policy, compensation for the PI in excess of two months must be disclosed in the proposal budget, justified in the budget justification, and specifically approved by NSF in the award notice budget.

Facilities, Equipment, and Other Resources: Provide a description of available facilities and priorities for their use, if applicable. For TRAILBLAZER projects requiring additional equipment, justify the need for these resources in the proposed research.

In the **Supplementary Documentation** section, include the following:

- **Unattributed Project Summary:** PIs must provide an unattributed version of the proposal Project Summary, which does **NOT** contain references to the PI's name, identity, or the PI's institution.
- **PO Concurrence email:** Upload the Concept Outline PO Concurrence email that indicates PO permission to submit a full proposal.
- **Results from Prior NSF Support** (maximum five pages): Please follow the guidance provided in the PAPPG for reporting results from prior NSF support. Note that this information does not need to be included in the Project Description of the proposal.
- **Mechanisms for sharing the outcomes** of the research with the scientific community, e.g., publications, web sites, *etc.* (maximum two pages). The description should be specific and should describe what, how, and when the community will have access to the outcomes of the project. This is particularly important for projects that will produce tangible research tools and resources.
- **Department Head Letter:** A signed letter from the PI's department head (or equivalent), or immediate supervisor if PI is Department Head, certifying the PI's eligibility must be uploaded as a supplementary document and contain **only** the text provided below:

"This letter certifies that the PI is a full-time tenured or tenure-eligible Associate or Full Professor, or equivalent at an organization that is eligible to submit as described under "Who May Submit Proposals." Additionally, the PI has an appointment in an Engineering School or College and/or has earned an Engineering Doctorate degree and is eligible to participate in the TRAILBLAZER solicitation as described under "Who May Submit Proposals"."

The **Data Management Plan** should describe the management of digital assets and intellectual property rights, including plans for sharing data, code, digital designs, information, and materials resulting from the award. Data and other digital products should be identified, and the following described for each of them:

- The types of data, samples, physical collections, software, curriculum materials, and other materials to be produced in the course of the project;
- Metadata to be collected and disseminated with primary data;
- The standards to be used for data and metadata format and content;
- Policies for access and sharing including provisions for appropriate protection of privacy, confidentiality, security, intellectual property, or other rights or requirements;
- Policies and provisions for re-use, re-distribution, and the production of derivatives;
- Release considerations: Timetable, Constraints, Responsible person(s), Public repository used;
- License for use (emphasis on open source licenses such as MIT and GPL);
- All software and code must be in a versioned code repository (e.g., GitHub/BitBucket) and released immediately. Code must be well documented for others to reuse;
- Other digital products including (but not limited to) 3D models for printing, circuit boards designs, phenotyping data, image data, and machine learning models must be included in the data management plan;
- Letters of commitment (uploaded as supplementary document(s)) should be provided from databases or stock centers that agree to distribute project outcomes, including the actions planned and funds needed (if any) for the distribution; and

Pre-submission Check List:

- The PI *must* be full-time tenured or tenure-eligible Associate or Full Professor, or equivalent, within an engineering college, school, or department and/or have earned an Engineering Doctorate degree;
- Total budget does not exceed \$3,000,000 and is spread over 3 years;
- **Broadening Participation Plan:** All proposals must describe a plan (both in the Project Summary and the Project Description) for promoting participation of the full spectrum of diverse talents in engineering;
- **Unattributed Project Summary:** An unattributed version of the proposal Project Summary, which does **NOT** contain references to the PI's name, identity, or to the PI's institution, is included as a supplementary document;
- **PO Concurrence email:** Concept Outline PO Concurrence email that indicates PO permission to submit a full proposal is included as a supplementary document;
- **Mechanisms for sharing the outcomes** of the research with the scientific community, e.g., publications, web sites, *etc.* (maximum two pages), is included as a supplementary document;
- **Department Head Letter:** A signed letter from the PI's department head (or equivalent), or immediate supervisor if PI is Department Head, certifying the PI's eligibility is included as a supplementary document.

This checklist is provided to aid in the preparation of the proposal. The burden to ensure that the proposal is complete and meets all solicitation requirements remains with the Principal Investigator.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

C. Due Dates

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

February 15, 2024

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 1-800-381-1532 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/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 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 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), the following criteria will be used in the review of all TRAILBLAZER proposals.

- **Investigator** – To what extent does the investigator provide strong evidence of creativity and impactful innovations?
- **Leadership** – To what extent does the investigator provide evidence of their established ability to lead and describe how they will form and lead a team appropriate for the proposed project?
- **Transformative** – To what extent does the proposed research represent an opportunity for a significant leap or paradigm shift in fundamental engineering and/or science knowledge?
- **National Need or Grand Challenge** – To what extent does the proposed research have the potential to make significant progress on a national need or grand challenge?
- **Broadening Participation Plan** – To what extent does the plan actively promote, increase, and enhance the participation of the full spectrum of diverse talents in the field of engineering?
- **Management Plan** – To what extent does the plan describe how a strong and effective team will be convened and led by the PI to conduct the proposed research?

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 Interview.

Based on ad hoc and Panel Review, the TRAILBLAZER Program will invite selected PIs for Panel interviews prior to making award recommendations. TRAILBLAZER anticipates extending invitations for interviews in April 2024, and holding interviews in late April to early May 2024.

The review criteria for the Interview Panel will be identical to those applied to the written proposal, as described above. Candidates will be evaluated in terms of their effectiveness at demonstrating evidence of past research innovations and creativity, the transformative nature of the proposed project, the suitability for the TRAILBLAZER Program, the plan to broaden participation in engineering.

The National Science Foundation will notify each PI of the schedule and location for their interview presentation and provide further details as they become available. Presentations should comply with these instructions and any additional instructions that NSF may provide prior to the interview.

Each interview will comprise the following activities:

- The PI will have the opportunity to present their proposed project to the Panel using electronic presentation tools.
- The Panel will ask questions of the PI following their presentation.

The PI will be directed to provide NSF with an electronic copy of their presentation one week in advance of their presentation.

Individuals with disabilities who need reasonable accommodations as part of the Blue Ribbon Panel process may contact the Office of Equity and Civil Rights' (OECR) Disability Program Manager (DPM) at rarequest@nsf.gov. For further information, see the Proposal & Award Policies & Procedures Guide, Section II.A.2.

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 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:

All funded TRAILBLAZER projects will form an NSF TRAILBLAZER cohort and investigators will be required to attend an annual PI meeting and may be invited to other activities.

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:

- TRAILBLAZER Program, telephone: N/A, email: TRAILBLAZER@nsf.gov
- Alias Smith, telephone: (703) 292-8367, email: alismith@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 (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.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** (703) 292-5111
(NSF Information Center):
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**
Send an e-mail to: nspfpubs@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
National Science Foundation
Alexandria, VA 22314

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