

NSF Small Business Innovation Research/ Small Business Technology Transfer Program Phase I (SBIR/STTR Phase I)

PROGRAM SOLICITATION NSF 23-515

REPLACES DOCUMENT(S): NSF 22-551



National Science Foundation

Directorate for Technology, Innovation and Partnerships
Translational Impacts

Submission Window Date(s) (due by 5 p.m. submitter's local time):

November 22, 2022 - March 01, 2023

March 02, 2023 - July 05, 2023

July 06, 2023 - November 01, 2023

IMPORTANT INFORMATION AND REVISION NOTES

The proposer must receive an official invitation via the Project Pitch process to submit a full proposal. Small businesses can submit a Project Pitch at any time. Small businesses that have been invited to submit a full proposal can submit a proposal based on that Project Pitch at any time during a submission window (up to one year after the receipt of the invitation). Visit the program website (<https://seedfund.nsf.gov/apply/project-pitch/>) for more information about the Project Pitch or visit section V.A of this document. Invited proposers may submit one Phase I proposal to either the NSF SBIR or STTR program and note their choice on their proposal Cover Sheet. (See section V.A. for more information.)

SBIR and STTR proposals are nearly identical but differ in the amount of work required to be performed by the small business and a not-for-profit institution or a Federally-funded research and development center (FFRDC) (as noted in the budget). NSF SBIR Phase I proposals submitted to this solicitation may, at NSF's discretion, be considered for award as an STTR Phase I. For more information about unique requirements for STTR awards, please refer to the Eligibility and Proposal Preparation sections of this solicitation.

NSF proposals are confidential and will only be shared with a select number of reviewers and NSF staff (as appropriate). All reviewers have agreed to maintain the confidentiality of the proposal content. Proposals to NSF do not constitute a public disclosure. If selected for a Phase I award, the company will be prompted to write a publicly available abstract that summarizes the intellectual merit and broader impact of the project.

Submission windows, unlike deadlines, allow small businesses to submit a full proposal *during the specific dates listed at the top of this document*. *The proposal submission system, Research.gov, will stop accepting proposals at 5:00 p.m. "submitter's time" on the submission window closing date, but, with the exception of the last submission window, will then reopen for new submissions the following morning. After the last submission window closes a new or updated solicitation may be posted shortly thereafter.*

The NSF SBIR/STTR program provides non-dilutive, firm-fixed price grants for the **development of a broad range of technologies, based on discoveries in science and engineering with potential for societal and economic impacts.**

The NSF SBIR/STTR program does not support clinical trials or proposals from companies whose commercialization pathway involves the production, distribution or sale by the company of chemical components, natural or synthetic variations thereof, or other derivatives related to Schedule I controlled substances.

Significant Revisions Made Since the Last Solicitation:

- NSF SBIR/STTR Phase I and Phase II solicitations will no longer be accepting proposals submitted through Fastlane. All proposals submitted to this solicitation must be through Research.gov. More details can be found at <https://seedfund.nsf.gov/apply/full-proposal/>.
- As part of the transition of proposal submissions to Research.gov, the incorporation of URLs or websites within the NSF SBIR/STTR Phase I proposal's Project Description will not be accepted.

- The Dun & Bradstreet issued Data Universal Numbering System (DUNS) number will no longer be used by NSF systems. Proposers will need to use the new SAM.gov Unique Entity ID (UEI) as the primary means of entity identification for NSF proposal submission.
- In compliance with the [CHIPS and Science Act of 2022](#), Section 10636 (Person or entity of concern prohibition) ([42 U.S.C. 19235](#)): No person published on the list under section 1237(b) of the Strom Thurmond National Defense Authorization Act for Fiscal Year 1999 (Public Law 105 261; 50 U.S.C. 1701 note) or [entity identified under section 1260h](#) of the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 (10 U.S.C. 113 note; Public Law 116 283) may receive or participate in any grant, award, program, support, or other activity under the Directorate for Technology, Innovation and Partnerships.

For the purpose of this solicitation, the following definitions apply:

- **Funding Agreement:** As used in this solicitation, the funding agreement is a Grant – a legal instrument of financial assistance between NSF and an awardee, consistent with 31 USC 6302-6305 and as noted in the NSF Proposal & Award Policies & Procedures Guide (PAPPG) Introduction, Section D ("Definitions & NSF-Recipient Relationships").
- **Small Business Concerns (SBCs):** SBCs are independently owned and operated businesses that are not dominant in the field of operation. For this solicitation, firms qualifying as a small business concern are eligible to participate in the SBIR/STTR program (see Section IV. "Eligibility Information" of this solicitation for more details). Please note that the size limit of 500 employees includes affiliates. The firm must be in compliance with the SBA SBIR/STTR Policy Directive and the Code of Federal Regulations (13 CFR 121).
- **SBIR/STTR Data:** As defined by the [SBA SBIR/STTR Policy Directive](#), SBIR/STTR Data is all Data developed or generated in the performance of an SBIR or STTR award, including Technical Data and Computer Software developed or generated in the performance of an SBIR or STTR award. The term does not include information incidental to contract or grant administration, such as financial, administrative, cost or pricing or management information.
- **SBIR/STTR Data Rights:** The Federal Government may, use, modify, reproduce, perform, display, release, or disclose SBIR/STTR Data that are Technical Data within the Government; however, the Government shall not use, release, or disclose the data for procurement, manufacturing, or commercial purposes; or release or disclose the SBIR/STTR Data outside the Government except as permitted by paragraph 10(B) of the SBIR/STTR Policy Directive's Data Rights Clause or by written permission of the Awardee.
- **Research and Development (R&D):** broadly defined in 2 CFR § 200.1, but specified for the NSF SBIR/STTR program as follows:
 - the application of creative, original and potentially transformative concepts to systematically study, create, adapt, or manipulate the structure and behavior of the natural or man-made worlds;
 - the use of the scientific method to propose well-reasoned, well-organized activities based on sound theory, computation, measurement, observation, experiment, or modeling;
 - the demonstration of a well-qualified individual, team, or organization ready to deploy novel methods of creating, acquiring, processing, manipulating, storing, or disseminating data or metadata; and/or
 - the novel integration of new theories, analysis, data, or methods regarding cognition, heuristics, and related phenomena, which can be supported by scientific rationale.
- **Non-Dilutive Funding:** financing that does not involve equity, debt, or other elements of the business ownership structure.
- **Technical Risk:** Technical risk assumes that the possibility of technical failure exists for an envisioned product, service, or solution to be successfully developed. This risk is present even to those suitably skilled in the art of the component, subsystem, method, technique, tool, or algorithm in question.
- **Technical Innovation:** Technical innovation indicates that the new product or service is differentiated from current products or services; that is, the new technology holds the potential to result in a product or service with a substantial and durable advantage over competing solutions on the market. It also generally provides a barrier to entry for competitors. This means that if the new product, service, or solution is successfully realized and brought to the market, it would be difficult for a well-qualified, competing firm to reverse-engineer or otherwise neutralize the competitive advantage generated by leveraging fundamental science or engineering research techniques.

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:

Small Business Innovation Research/ Small Business Technology Transfer Program Phase I (SBIR/STTR Phase I)

Synopsis of Program:

Introduction to the Program:

In 1977, the National Science Foundation (NSF) piloted and subsequently instituted the "Small Business Innovation Applied to National Needs" program, a precursor to the Small Business Innovation Research (SBIR) program and a first of its kind within the federal government. The goal of this program was to catalyze the innovative capabilities of small firms within the United States by supporting "high-risk, potentially high-payoff" projects [1]. The NSF SBIR/STTR program solicits proposals from small businesses based on groundbreaking scientific discoveries or significant engineering breakthroughs consistent with NSF's mission to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense. This NSF program is governed by 15 U.S.C. 638 and the National Science Foundation Act of 1950, as amended (42 U.S.C. 1861 et seq.).

The current NSF SBIR/STTR program continues this legacy of supporting the translation of scientific discovery into products and services with commercial potential and/or societal benefit. Unlike fundamental or basic research activities that focus on scientific and engineering discovery itself, the NSF SBIR/STTR program supports the creation of opportunities to move discoveries founded from fundamental science and engineering out of the lab and into the market or other use at scale, through startups and small businesses.

The NSF SBIR/STTR program provides non-dilutive research and development funding at the earliest stages of technology development.

Synopsis of Program:

The NSF SBIR/STTR program supports moving scientific excellence and technological innovation from the lab to the market. By funding startups and small businesses, NSF hopes to build a strong national economy and stimulate the creation of novel products, services, and solutions in the private sector with potential for broad impact; strengthen the role of small business in meeting federal research and development needs; increase the commercial application of federally supported research results; and develop and increase the US workforce, especially by fostering and encouraging participation by socially and economically disadvantaged and women-owned small businesses.

The NSF SBIR/STTR program welcomes proposals from many topics and does not have a specific technological focus (please see website at <https://seedfund.nsf.gov/portfolio/> for a listing of topics and cognizant Program staff). The program is open to proposals focusing on technical and market areas not explicitly noted, and such proposals should be submitted to "Other Topics".

[1] R. T. Tibbetts, "NSF's three-phase program helps the small-business innovator bootstrap an idea to commercial success," in *IEEE Spectrum*, vol. 15, no. 10, pp. 86-86, Oct. 1978, doi: 10.1109/MSPEC.1978.6367918.

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.

- Henry Ahn, telephone: (703) 292-7069, email: hahn@nsf.gov
- Peter S. Atherton, telephone: (703) 292-8772, email: patherto@nsf.gov
- Anna S. Brady-Estevez, telephone: (703) 292-7077, email: abrady@nsf.gov
- Edward Chinchoy, telephone: (703) 292-7103, email: echincho@nsf.gov
- Parvathi Chundi, telephone: (703) 292-5198, email: pchundi@nsf.gov
- Samir M. Iqbal, telephone: (703) 292-7529, email: smiqbal@nsf.gov
- Rajesh V. Mehta, telephone: (703) 292-2174, email: rmehta@nsf.gov
- Elizabeth Mirowski, telephone: (703) 292-2936, email: emirowsk@nsf.gov
- Alastair Monk, telephone: (703) 292-4392, email: amonk@nsf.gov

- Muralidharan S. Nair, telephone: (703) 292-7059, email: mnair@nsf.gov
- Erik Pierstorff, telephone: (703) 292-2165, email: epiersto@nsf.gov
- Benaiah D. Schrag, telephone: (703) 292-8323, email: bschrag@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: 250 to 360

- approximately 250-300 awards for SBIR Phase I per year, pending the availability of funds
- approximately 60 awards for STTR Phase I per year, pending the availability of funds

Anticipated Funding Amount: \$85,000,000

- Approximately \$70,000,000 for SBIR Phase I
- Approximately \$15,000,000 for STTR Phase I
- 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:

- Firms qualifying as a small business concern are eligible to participate in the NSF SBIR/STTR program (see [Eligibility Guide](#) for more information). Please note that the size limit of 500 employees **includes affiliates**. The firm must be in compliance with the [SBIR/STTR Policy Directive\(s\)](#) and the Code of Federal Regulations ([13 CFR Part 121](#)). For STTR proposals, the applicant small business must also include a partner research institution in the project, see additional details below. **AND**
- Proposers that have received an official invitation to submit a proposal from the cognizant NSF SBIR/STTR Program Director within the past twelve months. To receive the invitation, potential proposers must submit a Project Pitch document and receive an official response (via email) from the cognizant Program Director. *Please see section V.A for details.*

NSF does not fund proposals from companies that are majority-owned by one or more venture capital operating companies (VCOs), hedge funds, or private equity firms. Proposals from joint ventures and partnerships are permitted, provided the proposing entity qualifies as a small business concern (see [Eligibility Guide](#) for more information).

In compliance with the [CHIPS and Science Act of 2022](#), Section 10636 (Person or entity of concern prohibition) ([42 U.S.C. 19235](#)): No person published on the list under section 1237(b) of the Strom Thurmond National Defense Authorization Act for Fiscal Year 1999 (Public Law 105 261; 50 U.S.C. 1701 note) or [entity identified under section 1260h](#) of the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 (10 U.S.C. 113 note; Public Law 116 283) may receive or participate in any grant, award, program, support, or other activity under the Directorate for Technology, Innovation and Partnerships.

"Collaborative Proposal from Multiple Organizations" (a special proposal type in [Research.gov](#)) are not allowed. Collaborations with research institutions are encouraged; however, only one proposal, submitted by the company and with subawards to the research institution(s), is allowed.

Who May Serve as PI:

The primary employment of the Principal Investigator (PI) must be with the small business at the time of award and for the duration of the award, unless a new PI is named. Primary employment is defined as at least 51 percent employed by the small business. NSF normally considers a full-time work week to be 40 hours and considers employment elsewhere of greater than 19.6 hours per week to be in conflict with this requirement. The PI must have a legal right to work for the proposing company in the United States, as evidenced by citizenship, permanent residency, or an appropriate visa. The PI does not need to be associated with an academic institution. There are no PI degree requirements (i.e., the PI is not required to hold a Ph.D. or any other degree). A PI may be primarily employed at another organization at the time of submission, if he or she is primarily employed at the proposing small business at the time of award. A PI must devote a minimum of one calendar month of effort per six months of performance to an NSF SBIR/STTR Phase I project.

Limit on Number of Proposals per Organization: 1

An organization may submit only one NSF SBIR/STTR Phase I proposal per submission window (e.g., November 02, 2022 - March 01, 2023). An organization must wait for a determination from NSF (e.g., Award, Decline, or Returned Without Review) on the pending NSF SBIR/STTR Phase I proposal before submitting a new proposal in the next or any subsequent window. This eligibility constraint will be strictly enforced. If an organization exceeds this limit, the first proposal received will be accepted and any additional proposals submitted will be Returned Without Review. Similar limitations will be applied to the submission of Project Pitches. Please refer to Section V.A. of the solicitation for details. Declined proposals require a new invitation to submit (via the Project Pitch process) and significant revision, while proposals Returned Without Review may be submitted using the same invited Project Pitch (assuming that the proposal is received within one year of original the Project Pitch invitation).

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

For NSF SBIR – 1 PI, co-PIs are not allowed.

For NSF STTR - 1 PI, 1 co-PI required (must be part of the partner research institution).

An individual may be listed as the PI for only one proposal submitted at a time to this NSF SBIR/STTR Phase I solicitation. A PI must wait for a determination from NSF (e.g., Award, Decline, or Returned Without Review) on any NSF SBIR/STTR Phase I pending proposal before submitting a new proposal.

For NSF STTR proposals, a person may act as the co-PI on an unlimited number of proposals.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposal Submission:** Not required
- **Full Proposals:** This solicitation contains information that deviates from the standard *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) proposal preparation guidelines. Please see the full text of the solicitation for further information.

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

- **Submission Window Date(s)** (due by 5 p.m. submitter's local time):

November 22, 2022 - March 01, 2023

March 02, 2023 - July 05, 2023

July 06, 2023 - November 01, 2023

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:

Additional reporting requirements apply. Please see the full text of this solicitation for further information.

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I. INTRODUCTION

The NSF SBIR/STTR program focuses on transforming scientific discovery into commercial potential and/or societal benefit through the development of products or services.

The NSF SBIR/STTR program funds research and development (R&D) and is designed to provide non-dilutive funding to support startups or entrepreneurs with technologies at their earliest stages. NSF SBIR/STTR awards are not government contracts. The NSF does not use its SBIR/STTR programs to procure goods or services for the government, nor does the NSF receive any stake or interest in an awardee firm.

The NSF SBIR/STTR program does not have a specific topical or technology focus. Generally, the topics included in the NSF SBIR/STTR solicitation are intended to be broad enough to permit startups with science- and engineering-based innovations to compete for funding, transforming science and engineering discovery and innovation into both societal and economic impact. NSF encourages people from all backgrounds and geographic areas to apply for funding. At the

conclusion of the project, an awardee company must submit a final report to NSF to ensure that the company properly spent NSF funds on approved activities, as originally proposed. Awardee companies will also need to submit a project outcomes report for the general public. NSF does not purchase these project reports and does not benefit from these reports, beyond an oversight function. NSF does not test, verify, or otherwise use the technology developed under its SBIR/STTR awards.

The NSF SBIR/STTR Phase I program is highly competitive. While success rates vary year-to-year, only a fraction of proposals submitted are selected for an award. Thus, there are many qualified businesses applying to the program each year that do not receive funding.

II. PROGRAM DESCRIPTION

The NSF SBIR/STTR program encourages startups and small businesses to submit proposals across nearly all areas of science and engineering.*

While startups and small businesses face many challenges, the NSF SBIR/STTR funding is intended to specifically focus on challenges associated with technological innovation; that is, on the creation of new products, services, and other scalable solutions based on fundamental science or engineering. A successful Phase I proposal demonstrates how NSF funding will help the small business create a proof-of-concept or prototype by retiring technical risk. Funding from NSF may only be used to conduct research and development (R&D) to demonstrate technical feasibility.

NSF seeks SBIR/STTR proposals that represent success in three distinct, but related merit review criteria: Intellectual Merit, Broader Impacts, and Commercialization Potential.

The **Intellectual Merit** criterion encompasses the potential to advance knowledge and leverages fundamental science or engineering research techniques to overcoming technical risk. This can be conveyed through the **Research and Development (R&D)** of the project. R&D is broadly defined in 2 CFR § 200.1, but specified for the NSF SBIR/STTR program as follows:

- the application of *creative, original and potentially transformative concepts* to systematically study, create, adapt, or manipulate the structure and behavior of the natural or man-made worlds;
- the use of the scientific method to propose *well-reasoned, well-organized activities based on sound theory, computation, measurement, observation, experiment, or modeling*;
- the demonstration of a *well-qualified individual, team, or organization* ready to deploy novel methods of creating, acquiring, processing, manipulating, storing, or disseminating data or metadata; and/or
- the novel integration of new theories, analysis, data, or methods regarding cognition, heuristics, and related phenomena.

NSF SBIR/STTR proposals are often evaluated via the concepts of Technical Risk and Technological Innovation. **Technical Risk** assumes that the possibility of technical failure exists for an envisioned product, service, or solution to be successfully developed. This risk is present even to those suitably skilled in the art of the component, subsystem, method, technique, tool, or algorithm in question. **Technological Innovation** indicates that the new product or service is differentiated from current products or services; that is, the new technology holds the potential to result in a product or service with a substantial and durable advantage over competing solutions on the market. It also generally provides a barrier to entry for competitors. This means that if the new product, service, or solution is successfully realized and brought to the market, it should be difficult for a well-qualified, competing firm to reverse-engineer or otherwise neutralize the competitive advantage generated by leveraging fundamental science or engineering research techniques.

The **Broader Impacts** criterion encompasses the potential benefit to society and contribution to the achievement of specific, desired societal outcomes as outlined in the NSF PAPPG Merit Review Broader Impacts Criteria.

The NSF SBIR/STTR program funds the development of new, high-risk technology innovations intended to generate positive societal and economic outcomes. Proposers should also consider the Broader Impacts Review Criterion at 42 U.S.C. §1862p-14:

- Increasing the economic competitiveness of the United States.
- Advancing of the health and welfare of the American public.
- Supporting the national defense of the United States.
- Enhancing partnerships between academia and industry in the United States.
- Developing an American STEM workforce that is globally competitive through improved pre-kindergarten through grade 12 STEM education and teacher development and improved undergraduate STEM education and instruction.
- Improving public scientific literacy and engagement with science and technology in the United States.
- Expanding participation of women and individuals from underrepresented groups in STEM.

The **Commercialization Potential** of the proposed product or service is the potential for the resulting technology to disrupt the targeted market segment by way of a strong and durable value proposition for the customers or users.

- The proposed product or service addresses an unmet, important, and scalable need for the target customer base.
- The proposed small business is structured and staffed to focus on aggressive commercialization of the product/service.
- The proposed small business can provide evidence of good product-market fit (as validated by direct and significant interaction with customers and related stakeholders).

More details and information regarding the NSF SBIR/STTR merit review criteria can be found in Section VI of this solicitation.

** The NSF SBIR/STTR program does not support clinical trials or proposals from companies whose commercialization pathway involves the production, distribution or sale by the company of chemical components, natural or synthetic variations thereof, or other derivatives related to Schedule I controlled substances.*

III. AWARD INFORMATION

Phase I proposals may be submitted for up to \$275,000 in R&D funding intended to support projects for 6-12 months. This amount is inclusive of all direct and indirect costs as well as the small business fee. 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:

- Firms qualifying as a small business concern are eligible to participate in the NSF SBIR/STTR program (see [Eligibility Guide](#) for more information). Please note that the size limit of 500 employees **includes affiliates**. The firm must be in compliance with the [SBIR/STTR Policy Directive\(s\)](#) and the Code of Federal Regulations ([13 CFR Part 121](#)). For STTR proposals, the applicant small business must also include a partner research institution in the project, see additional details below. **AND**
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For NSF SBIR – 1 PI, co-PIs are not allowed.

For NSF STTR - 1 PI, 1 co-PI required (must be part of the partner research institution).

An individual may be listed as the PI for only one proposal submitted at a time to this NSF SBIR/STTR Phase I solicitation. A PI must wait for a determination from NSF (e.g., Award, Decline, or Returned Without Review) on any NSF SBIR/STTR Phase I pending proposal before submitting a new proposal.

For NSF STTR proposals, a person may act as the co-PI on an unlimited number of proposals.

Additional Eligibility Info:

Required Project Pitch Invitation: Potential proposers must receive an invitation to submit a full NSF SBIR/STTR Phase I proposal. To start this process, proposers must first create a log in and submit a Project Pitch via the [online form](#). The cognizant NSF SBIR/STTR Program Director will use the Project Pitch to determine whether the proposed project is a good fit for the program. *Please see section V.A for details.*

Broad Participation. Socially and economically disadvantaged small businesses and women-owned small businesses are encouraged to participate.

STTR Research Institution. The [SBIR/STTR Policy Directive](#) requires that STTR Phase I proposals include an eligible research institution as a subawardee on the project budget. The STTR partner research institution is typically either a not-for-profit institution focused on scientific or educational goals (such as a college or university), or a Federally funded research and development center (FFRDC). For an NSF STTR Phase I Proposal, a minimum of 40% of the research, as measured by the budget, must be performed by the small business concern, and a minimum of 30% must be performed by a single partner research institution, with the balance permitted to be allocated to either of these, or to other subawards or consultants.

Partnering. Proposing firms are encouraged to collaborate with experienced researchers at available facilities such as colleges, universities, national laboratories, and from other research sites. Funding for such collaborations may include research subcontracts or consulting agreements. The employment of faculty and students by the small business is allowed; however,

- **For an NSF SBIR Phase I proposal**, a minimum of two-thirds of the research, as measured by the budget, must be performed by the small business. The balance of the budget may be outsourced to subawards or consultants or a combination thereof. Although partnering is encouraged, proposals should NOT be marked as a "Collaborative Proposal from Multiple Organizations" during submission.
- **For an NSF STTR Phase I proposal**, a minimum of 40% of the research, as measured by the budget, must be performed by the small business. A minimum of 30% must be performed by a single partner research institution; The balance (remaining 30%) may be allocated to the small business, partner research institution, or to other subawards or consultants. Although partnering with a research institution is required for STTR proposals, proposals should NOT be marked as a "Collaborative Proposal from Multiple Organizations" during submission.

Government-Wide Required Benchmarks: (Applies to previous SBIR/STTR awardees ONLY)

Phase I to Phase II Transition Rate Benchmark. For Phase I proposers that have received more than 20 Phase I SBIR/STTR awards from any federal agency with an SBIR/STTR program over the past five fiscal years, the minimum Phase I to Phase II Transition Rate is 0.25 over those five fiscal years. Small businesses that fail to meet this transition requirement will be notified by the Small Business Administration and will not be eligible to submit a Phase I proposal for one year from the June 1st assessment.

Commercialization Benchmark. The commercialization benchmark required by the SBIR/STTR Reauthorization Act of 2011 only applies to proposers that have received more than 15 Phase II Federal SBIR/STTR awards over the past 10 fiscal years, excluding the last two years. These companies must have achieved the minimum required commercialization activity to be eligible to submit a Phase I proposal, as determined by the information entered in the company registry at [SBIR.gov](https://www.sbir.gov). Firms for which the commercialization benchmark applies should consult [SBIR.gov](https://www.sbir.gov) for more information.

Visit [sbir.gov](https://www.sbir.gov) for more information on required benchmarks.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Preparation Instructions: Proposals submitted in response to this program solicitation should be prepared and submitted in Research.gov 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.

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.

This solicitation contains MANY instructions that deviate from the standard NSF PAPPG proposal preparation instructions. This solicitation contains the information needed to prepare and submit a proposal and refers to specific sections of the PAPPG ONLY when necessary (and noted throughout the solicitation). In the event of conflict between the instructions in this solicitation and the PAPPG, use this solicitation's instructions as a guide.

Program Objectives: NSF supports innovative technologies showing promise of commercial and/or societal impact and involving technical risk, to be addressed with techniques drawn from fundamental science and engineering research.

Required Project Pitch submission: Potential proposers must receive an invitation to submit a full NSF SBIR/STTR Phase I proposal. Project Pitches may be submitted and will be reviewed on an ongoing basis (even if there is no Phase I solicitation currently open at NSF). To start this process, proposers must first create a log in and submit a Project Pitch via the [online form](#). NSF SBIR/STTR program staff will use the Project Pitch to determine whether the proposed project may be a good fit for the Program Objectives.

- Proposers are encouraged to submit a Project Pitch at any time, regardless of the NSF SBIR/STTR Phase I solicitation windows.
- Proposers can submit one Project Pitch per submission window.
- The small business will be asked to describe the technology innovation, key technical objectives and challenges, the market opportunity, and the company and team in the Project Pitch.
- NSF will review the submitted Project Pitch and officially respond via email. They may ask for more information before making a final decision.
- If the proposed project is determined to be a good fit for the Program Objectives (stated above), the small business representative who submitted the Project Pitch will receive an invitation via email to submit a full proposal. This invitation entitles the recipient to submit a full proposal to any open NSF SBIR/STTR Phase I solicitation and is valid for 12 months from the date of the invitation. The invitation email must be uploaded in the Supplementary Documents of the full proposal.
- If the proposed project is determined not to be responsive to the NSF SBIR/STTR Phase I Program solicitation (please refer to the "*Project Activities Not Responsive to the Solicitation*" section of this document as well as the listed eligibility criteria), the potential proposer will receive a notice stating that the small business is not invited to submit a proposal.
- Project Pitches that are not invited to submit a full proposal may resubmit a Project Pitch (with revisions to address any deficiencies) in the next submission window.
- A small business with a pending Project Pitch must wait to receive a response before submitting another Project Pitch. Additional Project Pitches submitted by an entrepreneur or small business with a pending Project Pitch will not

be reviewed nor invited.

- A small business that has received an invitation to submit a full proposal must wait for that proposal to be submitted and resolved before submitting another Project Pitch. If the small business decides not to pursue that project and wishes to submit another, different Project Pitch, they should reach out to sbir@nsf.gov to request that their existing invitation be withdrawn.
- Potential proposers who do not receive an invitation to submit a proposal are not eligible to apply for NSF SBIR/STTR Phase I funding. **Proposals submitted without a Project Pitch invitation will be Returned Without Review.**

An NSF SBIR/STTR Phase I project must be focused on using R&D to determine the scientific and technical feasibility of a new concept or innovation that could be developed into new products, processes, or services. A successful Phase I proposal demonstrates that the NSF-funded R&D will significantly reduce the technical risk involved in bringing these new products, processes, or services to market.

Project Pitch Contents:

The [Project Pitch](#) includes:

- Name, location, corporate website, and contact information for the proposing company (if already incorporated/organized);
- Name and contact information for the company official or technical lead who is submitting the Project Pitch.
- Up to 500 words describing the **Research and Development (or Technological Innovation)** that would be the focus of a Phase I project, including a brief discussion of the origins of the innovation as well as an explanation as to why it meets the program's mandate to focus on supporting R&D of unproven, high-impact innovations. (See definition of R&D above.)
- Up to 500 words describing the **Technical Objectives and Challenges** to be done in a Phase I project, including a discussion of how and why the proposed work will help prove that the product or service is technically feasible and/or how the proposed scope of work will significantly reduce technical risk using techniques drawn from fundamental science and engineering research. Discuss how this work could contribute to making the new product, service, or process commercially viable and impactful. This section should also convey that the proposed work meets the NSF SBIR/STTR definition of R&D above, rather than straightforward engineering or incremental product development tasks.
- Up to 250 words describing the **Market Opportunity**, the customer profile and the pain point(s) that will be the near-term commercial focus related to this technical project.
- Up to 250 words describing the **Company and Team**, that is, the background and current status of the applicant small business, including key team members who will lead the technical and/or commercial efforts discussed in the Project Pitch.

Project Activities Not Responsive to the Solicitation.

- Evolutionary development or incremental modification of established products or proven concepts;
- Straightforward engineering efforts with little technical risk;
- Evaluation or testing of existing products;
- Basic scientific research unconnected to any specific market opportunity or potential new product, process or service;
- Business development, market research, and sales and marketing); and/or
- Clinical trials.
- The NSF SBIR/STTR program does not support proposals from companies whose commercialization pathway involves the production, distribution or sale by the company of chemical components, natural or synthetic variations thereof, or other derivatives related to Schedule I controlled substances.

Proposals that do not address the requirements listed above may be Returned Without Review. NSF SBIR/STTR Phase I proposals Returned Without Review by NSF are NOT eligible for review again in the same submission window. An NSF SBIR/STTR Phase I proposal Returned Without Review may be submitted in a subsequent submission window if: 1) the Project Pitch is still valid (i.e., the one-year period from the invite has not expired); and 2) the proposal complies with the solicitation requirements.

Confidentiality and Proprietary Information. Your proposal is confidential and will only be shared with a small number of reviewers and NSF staff (as appropriate) who have agreed to maintain the confidentiality of the proposal content. Your proposal to NSF does not constitute a public disclosure. **If your company is chosen for an NSF SBIR/STTR Phase I award, you will be prompted to write an abstract expressing the intellectual merit and broader impact of the effort, to be made available to the public.**

NSF SBIR/STTR data, including proposals, are protected from disclosure by the participating agencies for not less than 20 years from the delivery of the last report or proposal associated with the given project. To the extent permitted by law, the government will not release properly identified technical and commercially sensitive data. If the proposal contains

proprietary information, check the box at the bottom of the proposal Cover Sheet and identify proprietary technical data in the proposal by clearly marking the information and also providing a legend. Typically, proprietary information is identified in the text either with an asterisk at the beginning and end of the proprietary paragraph, underlining the proprietary sections, or choosing a different font type. An entire proposal should not be marked proprietary.

A. Registrations

Small businesses applying for NSF SBIR/STTR Phase I funding must be registered with the following systems in order to submit a proposal to NSF.

Note that some of the registrations below (in particular, SAM.gov) can take several weeks or even months to process, so please start early.

You must register your company name, physical address and all other identifying information *identically* in each of these systems. We recommend that you register your small business in the following order:

- **System for Award Management (SAM) Registration.** You MUST register to do business with the U.S. government through System for Award Management (SAM). When you register, you will have to share bank account information of the account where the NSF funds would be deposited. This registration process is free and takes only 10-15 minutes to initiate but can take weeks or even months to process. An active SAM.gov registration and its associated SAM.gov Unique Entity Identifier (UEI) is needed to create a Research.gov account and submit a proposal to NSF. To submit proposals to NSF SBIR/STTR, you only need to request "financial assistance" authority and do NOT need "contract" authority (which can be a much longer process to obtain). SAM registration must be renewed annually.
- **Small Business Administration (SBA) Company Registration.** A Small Business Concern Identification number (SBC ID) is required prior to submission of the proposal. SBA maintains and manages a Company Registry for SBIR/STTR proposers at <https://www.sbir.gov/registration/> to track ownership and affiliation requirements. All SBCs must report ownership information prior to each SBIR/STTR proposal submission and update the SBC if any information changes prior to award.
- **Research.gov:** For more information, consult the "About Account Management" page at <https://www.research.gov/>.

B. Tips on the Proposal Preparation and Submission

Failure to comply with the below guidelines means that a proposal may be Returned Without Review.

- **DO** upload the official email invitation you received via the Project Pitch process to submit a full proposal (sent by an NSF Program Director in response to your Project Pitch submission) in the "Single Copy Documents" module. Convert this email invitation into a PDF before uploading.
- **DO INCLUDE ALL REQUIRED ELEMENTS.** Submit a proposal that is complete. Even if the Research.gov system allows a proposal to be submitted without these items, proposals must have each of the items listed below, unless indicated.
 - [Cover Sheet](#)
 - [SBIR Phase I Questionnaire](#)
 - [SBIR Phase I Certification Questions](#)
 - [Project Summary](#)
 - [Project Description](#)
 - [References Cited](#)
 - [Budget\(s\)](#)
 - [Budget Justification\(s\)](#)
 - [Facilities, Equipment and Other Resources](#)
 - [Senior Personnel Documents](#)
 - [Biographical Sketch](#)
 - [Current and Pending Support](#)
 - [Collaborators & Other Affiliation Information \(Single Copy Document\)](#)
 - [Data Management Plan](#)
 - [Postdoctoral Mentoring Plan \(Conditionally required\)](#)
 - [Optional](#)
 - [Letters of Support \(Strongly recommended\)](#)
 - [Cooperative Research Agreement \(Required for STTR only\)](#)
 - [Other Personnel Biographical Information \(Strongly recommended\)](#)
 - [Other Supplementary Documents](#)
 - [Company Commercialization History \(Required, if applicable\)](#)
 - [Letters of Commitment from Subawardees and Consultants \(Strongly recommended\)](#)
 - [Resubmission Change Description \(Required, if applicable\)](#)
 - [List of Suggested Reviewers \(Single Copy Document\)](#)
 - [List of Reviewers Not to Include \(Single Copy Document\)](#)
 - [Deviation Authorization \(Single Copy Document\)](#)

- **Additional Single Copy Documents**

- **DO provide a company commercialization history (if applicable).** Submit a [Company Commercialization History form](#) (on the NSF template) if your company has received an SBIR/STTR Phase II award(s) previously (from any agency). DO NOT modify the template to include additional narrative or information beyond what is required on the form.
- **DO be aware that the proposal submission system (Research.gov) will stop accepting submissions at 5:00 p.m. "proposer's time" on the submission window closing date** but will reopen the next day for the new submission window as noted in this solicitation (with exception to the final window closing date). Proposer's time zone is set by the company in the organization registration area of Research.gov.
- **DO NOT** submit a proposal if your project has not yet received a Project Pitch invitation via email from an NSF SBIR/STTR Program Director. Proposals without this invitation will be Returned Without Review. See *section V.A for details*.
- **DO NOT** submit a Project Description that is more than 15 pages long.
- **DO NOT** submit a Budget exceeding \$275,000. This amount is inclusive of all direct and indirect costs as well as the small business fee.
- **DO NOT** include any funds on Lines E2, F or G2 of the Budget. These are not allowable costs under a Phase I grant.
- **DO NOT** submit a "Collaborative Proposal from Multiple Organizations" (a special proposal type in Research.gov). Collaboration with research institutions is encouraged; however, only one proposal, submitted by the company and with subawards to the research institution(s), is allowed.
- **DO NOT** submit a proposal that lacks sufficient discussion of the NSF and solicitation merit review criteria: intellectual merit, broader impacts, and commercial potential.
- **DO NOT** submit a proposal lacking research based on techniques drawn from fundamental science or engineering. A proposal must be explicitly responsive to the solicitation requirements. Section V.D recommends a minimum length of 10 pages for the Project Description document to provide sufficient detail on the key technical, societal and commercial aspects of the project.
- **DO NOT** upload information beyond what is specifically required and permitted into the proposal (e.g., do not include marketing materials, research results, academic papers, patent applications, etc.)
- **DO NOT** upload any documents to the "ADDITIONAL Single Copy Documents" subsection under the "Single Copy Documents" section in Research.gov *with the following exceptions*: 1) you must submit the email invitation from an NSF Program Director in response to your submitted Project Pitch, 2) you must complete the "[Collaborators and Other Affiliations](#)" Information Section; and 3) at your option, you may also complete the "List of Suggested Reviewers" section.
- **DO NOT** upload documents to the "Supplementary Documents" section except those described in [Supplementary Documents](#).
- **DO NOT** include samples, videotapes, slides, appendices, or other ancillary items within a proposal submission. Websites containing demonstrations and Uniform Resource Locators (URLs) (if applicable) must be cited in the References Cited section, but reviewers are not required to access them. Please refer to the NSF PAPPG (Chapter II.C) for more details on accepted proposal fonts and format. The incorporation of URLs or websites within the proposal's Project Description will not be accepted.

C. Detailed Instructions on Invited Proposal Preparation

- **Cover Sheet.** This section requests general information about the proposal and proposing organization. In addition, it covers two important aspects as noted below, which must be addressed if the proposed projects includes human subjects research or research on vertebrate animals.
 - **Human Subjects Documentation (if applicable, uploaded into Cover Sheet Section).** Projects involving research with human subjects must ensure that subjects are protected from research risks in conformance with the relevant Federal policy known as the Common Rule (*Federal Policy for the Protection of Human Subjects*, 45 CFR 690). All projects involving human subjects must either (1) have approval from an Institutional Review Board (IRB) before issuance of an NSF award; or, (2) must obtain a statement from the IRB indicating research exemption from IRB review. This documentation needs to be completed during due diligence discussions, in accordance with the applicable subsection, as established in section 101(b) of the Common Rule. If certification of exemption is provided after submission of the proposal and before the award is issued, the exemption number corresponding to one or more of the exemption categories also must be included in the documentation provided to NSF. The small business has three basic options with regard to human subjects review:
 - Establish your own IRB (see Office for Human Research Protections (OHRP) at the Department of Health and Human Services (HHS): <https://www.hhs.gov/ohrp/irbs-and-assurances.html#registernew>.)
 - Use the review board of a (usually local) university or research institution, either via consultants to the project, a project subcontract, or directly through its own contacts;
 - Use a commercial provider.

- For projects lacking definite plans for the use of human subjects, their data, or their specimens, pursuant to 45 CFR § 690.118, NSF can accept a determination notice that establishes a limited time period under which the PI may conduct preliminary or conceptual work that does not involve human subjects. See more information and instructions regarding this documentation in the PAPPG.
- **Vertebrate Animals Documentation (if applicable, Uploaded into Cover Sheet Section).** Any project proposing use of vertebrate animals for research or education shall comply with the Animal Welfare Act (7 USC 2131, et seq.) and the regulations promulgated thereunder by the Secretary of Agriculture (9 CFR 1.1-4.11) pertaining to the humane care, handling, and treatment of vertebrate animals held or used for research, teaching or other activities supported by Federal awards. In accordance with these requirements, proposed projects involving use of any vertebrate animal for research or education must be approved by the submitting organization's Institutional Animal Care and Use Committee (IACUC) before an award can be made. For this approval to be accepted by NSF, the organization must have a current Public Health Service (PHS) Approved Assurance. See also PAPPG for additional information on the administration of awards that utilize vertebrate animals. This documentation must be completed before issuance of an NSF award.
- **SBIR (or STTR) Phase I Questionnaire.** The Phase I Questionnaire must be filled in completely including: Phase I Information (SBIR/STTR Phase I Topic and required Project Pitch Number), Authorized Company Officer Information, Proposing Small Business Information, SBIR/STTR Award History, Affiliated Companies, and Other Information.
- **SBIR (or STTR) Phase I Certification Questions.** The Phase I Certification Questions must be filled in completely.
- **Project Summary [One (1) page MAXIMUM].** The Project Summary should be written in the third person, informative to other persons working in the same or related fields, and insofar as possible, understandable to a scientifically or technically literate lay reader. It should not be an abstract of the proposal. Do not include proprietary information in the summary. Proposals lacking a complete Project Summary will not be accepted by Research.gov or will be Returned Without Review. The Project Summary is to be completed with headers on three separate lines for Overview, Intellectual Merit, and Broader Impacts. To be valid, a heading must be on its own line with no other text on that line. The document must be converted to pdf format to be uploaded into Research.gov.
 - **Overview:** Describe the potential outcome(s) of the proposed activity in terms of a product, process, or service. Provide a list of key words or phrases that identify the areas of technical expertise to be invoked in reviewing the proposal and the areas of application that are the initial target of the technology. Provide the subtopic name.
 - **Intellectual Merit:** This section MUST begin with "This Small Business Innovation Research (or Small Business Technology Transfer) Phase I project..." Address the intellectual merits of the proposed activity. Briefly describe the technical hurdle(s) that will be addressed by the proposed R&D (which should be crucial to successful commercialization of the innovation), the goals of the proposed R&D, and a high-level summary of the plan to reach those goals.
 - **Broader Impacts:** Discuss the expected outcomes in terms of how the proposed project will bring the innovation closer to commercialization under a sustainable business model. In this box, also describe the potential commercial and market impacts that such a commercialization effort would have, if successful. Also discuss potential broader societal and economic impacts of the innovation (e.g., educational, environmental, scientific, societal, or other impacts on the nation and the world).
- **Project Description. [Ten (10) pages MINIMUM; fifteen (15) pages MAXIMUM].** The project description is the core of the proposal document, where the PI convinces the expert reviewers/panelists and NSF SBIR/STTR Program Director that his/her proposed R&D project meets NSF's criteria for intellectual merit, broader impacts, and commercial opportunity (please refer to Section II. *Program Description* of this solicitation for details regarding these criteria).

Present evidence that the proposed technology is innovative, that development of it entails high technical risk, and that you have a credible plan to establish technical feasibility during Phase I. Convince the reviewers that the company and the project team have the necessary expertise, resources, and support to carry out the project and that they are committed to building a viable business around the product/service being developed. Finally, present a compelling case that the project will significantly advance the readiness of the technology and strengthen its commercial position. The format below is strongly suggested for the Project Description.

Elevator Pitch (no more than one page)

- The Motivation. Describe the company's motivation for pursuing this project and the expected impact from the proposed technology, if successful.
- The Customer. Describe the expected customer for the innovation. Which unmet customer or market needs are you addressing?
- The Value Proposition. What are the benefits to the customer of your proposed innovation? What is the key differentiator of your company or technology? What is the potential societal value of your innovation?
- The Innovation: Succinctly describe your innovation. Which aspects are original and transformative compared to the current state of the art? How is the innovation differentiated from any work done by others in the field?

(This section may contain information excluded from the Project Summary because of the proprietary nature.)

The Commercial Opportunity (recommended length: 1-3 pages)

- Describe the market and addressable market for the innovation.
- Discuss the business economics and market drivers in the target industry.
- How has the market opportunity been validated? Describe your customers and your basic business model. Describe the competition. How do you expect the competitive landscape may change by the time your product/service enters the market?
- What are the key commercial risks in bringing your innovation to market?
- Describe your commercialization approach. Discuss the potential economic benefits associated with your innovation and provide estimates of the revenue potential, detailing your underlying assumptions.
- Describe the resources needed to implement your commercialization approach.
- Describe your plan and expected timeline to secure these resources.

The Technical Solution (recommended length: 2-4 pages)

- Briefly describe the proposed solution and the technology on which it is based. At what stage of technical development is the innovation? (A more detailed description can be provided in the Technical Discussion and R&D Plan, as described below).
- Describe the key technical challenges and risks in bringing the innovation to market. Which of these will be your focus and what is the general scientific approach in the proposed Phase I project?
- Describe the status of the intellectual property associated with this project and how you plan to protect it.
- NSF Lineage (not required for eligibility): Does your project have roots in non-SBIR/STTR NSF funding, either to the company or other organizations/institutions? If applicable, list the NSF funding division(s) and award number(s) as follows: "This project is based on the following NSF lineage: funded by [PI/Organization/Institution] with award number [7-digit NSF award #]."
- I-Corps Lineage (not required for eligibility): If the project team has participated in an I-Corps cohort (regional or national), please identify the host organization as follows: "This team has participated in an I-Corps activity hosted by [Organization/Institution] with award number [7-digit NSF award #]". Please contact the host organization for the relevant award number.

The Company/Team (recommended length: 1-3 pages)

- Describe the company founders or key participants in this proposed project. What level of effort will these persons devote to the proposed Phase I activities? How does the background and experience of the team enhance the credibility of the effort; have they previously taken similar products/services to market?
- Describe your vision for the company and the company's expected impact over the next five years.
- If the company has existing operations, describe how the proposed effort would fit into these activities.
- Provide the date when the company was founded and describe the revenue history, if any, for the past three years. Include and explicitly state government funding and private investment in this discussion.
- Will you have consultants or subawardees working on this project? If so, what is their expertise, affiliation, and contribution to the project?

Intellectual Merits: Technical Discussion and R&D Plan (minimum length: 5 pages, recommended length: 5-6 pages)

- The Intellectual Merits section should begin with the header "Intellectual Merits" on its own line.
- Describe the innovation in sufficient technical detail for a knowledgeable reviewer in the field to understand why it is innovative and how it can provide benefits in the target applications. Supplement this description with any necessary background information.
- Describe the key objectives to be accomplished during the Phase I research, including the questions that must be answered to determine the technical AND commercial feasibility of the proposed concept.
- Describe the critical technical milestones that must be met to get the product or service to market.
- Present an R&D plan, with proposed timeline. What are the objectives, and what experiments, computations, success criteria, etc. are planned to reach those objectives? The R&D plan must leverage fundamental science or engineering research and techniques.

Broader Impacts: (recommended length: 1-2 pages)

- The Broader Impacts section should begin with the header "Broader Impacts" on its own line.
- Describe how the proposed product or service offers the potential for broader societal and economic benefit (through commercialization under a sustainable business model) as outlined in the [NSF Merit Review Broader Impacts Criteria](#).
- The NSF SBIR/STTR program funds the development of new, high-risk technology innovations intended to generate positive societal outcomes. Examples of such outcomes include (but are not limited to) those found

in the American Innovation and Competitiveness Act (P.L. 114-329, Section 102) Broader Impacts Review Criterion update:

- *Increasing the economic competitiveness of the United States.*
- *Advancing of the health and welfare of the American public.*
- *Supporting the national defense of the United States.*
- *Enhancing partnerships between academia and industry in the United States.*
- *Developing an American STEM workforce that is globally competitive through improved pre-kindergarten through grade 12 STEM education and teacher development, and improved undergraduate STEM education and instruction.*
- *Improving public scientific literacy and engagement with science and technology in the United States.*
- *Expanding participation of women and individuals from underrepresented groups in STEM.*
- The NSF SBIR/STTR program seeks plans to generate these outcomes as well as related societal benefits. Discuss the envisioned broader impacts and the specific implementation plan, including: the relevant metrics and measurement plan; potential partners to enhance the likelihood of success (including an assessment of the value proposition to the partner, their reasons for engaging in this project, and a summary of the engagement to date); potential risks and associated mitigation strategies; and additional anticipated needs for resources and the plan to secure them.
- **References Cited.** Provide a comprehensive listing of relevant references, including websites or relevant URLs, patent numbers, and other relevant intellectual property citations. A list of References Cited must be uploaded into the system. If there are no references cited in the proposal, please indicate this by putting the statement "No References Cited" into this module.
- **Budget(s).** Proposers are required to submit budgets with their proposals, including specific dollar amounts by budget category. Proposers must submit a written justification explaining these amounts in detail. NSF SBIR/STTR Program Directors review these proposed budgets and rely on them in determining the final amount awarded for a given SBIR/STTR project. Detailed documentation of all budget line items is required and **MUST** be documented in detail on the Budget Justification page (see next section). The proposed budget should reflect the needs of the proposed R&D project. Line numbers below refer to the required budget format in Research.gov, NSF's proposal submission system. The total budget shall not exceed \$275,000 for the Phase I proposal.
 - **Line A - Senior Personnel.** List the PI, co-PI (if STTR), and Senior Personnel by name, their time commitments (in calendar months), and the dollar amount requested. The PI must be budgeted for a minimum of one calendar month of effort per six months of performance to the NSF SBIR/STTR Phase I proposed project. The best source in determining an appropriate salary request is the [Bureau of Labor Statistics](#). In the Budget Justification provide the title; annual, monthly, or hourly salary rate; time commitment; a calculation of the total requested salary; and a description of responsibilities for the PI, co-PI (if STTR), and each of the Senior Personnel.
 - **Line B - Other Personnel.** List the number of additional general personnel (technicians, programmers, etc.) and the total monetary and time commitment for these personnel. These personnel must be employed at the proposing company. The details of the individual commitments, roles, and requested funds should be provided in the Budget Justification. Do NOT list company employees under B.1, B.3, or B.4 in the main budget. Post-doctoral scholars and students (undergraduate and graduate) should be listed on a subaward budget to a research institution, unless they are employees of the company, in which case they may be listed under Lines A, B.2, or B.6, as appropriate.
 - **Line C - Fringe Benefits.** It is recommended that proposers allot funds for fringe benefits here **ONLY** if the proposer's usual (established) accounting practices provide that fringe benefits be treated as direct costs. Otherwise, fringe benefits should be included in Line I (Indirect Costs).
 - **Line D - Equipment.** Equipment may NOT be purchased on an NSF SBIR/STTR Phase I grant. Equipment is defined as an item of property that has an acquisition cost of \$5,000 or more (unless the organization has established lower levels) and an expected service life of more than one year.
 - **Line E.1 - Travel.** One domestic travel trip for up to two persons (the PI is required to attend, and we recommend also including an individual who leads the related business/commercial efforts, if not the PI) should be budgeted to attend a three-day Grantee Conference in the DC area (pending COVID-19 related travel and social distancing considerations). The intent of this conference is to discuss the research program with the cognizant NSF SBIR/STTR Program Director, learn about preparing an NSF SBIR/STTR Phase II proposal, and hear from experts on various topics of interest to technical entrepreneurs. A written statement acknowledging the attendance requirement at the mandatory grantee conference is required on the Budget Justification page. A reasonable budget estimate is \$2,000 per person to cover the conference registration fees and travel expenses. Outside of this event, all other budgeted travel must be necessary for the successful execution of the Phase I R&D effort. Travel for purposes other than the project R&D effort (e.g., marketing, customer engagements) is not permitted in the NSF SBIR/STTR Phase I budget, **EXCEPT** as permitted for participation in the Beat-the-Odds Camp, see discussion below for Line G.6.
 - **Line E.2 - Foreign travel expenses.** Foreign travel expenses are NOT permitted.
 - **Line F - Participant Support Costs.** Participant support costs are NOT permitted on an NSF SBIR/STTR Phase I grant.

- **Line G.1 - Materials and Supplies.** Materials and supplies are defined as tangible personal property, other than equipment, costing less than \$5,000, or other lower threshold consistent with the policy established by the proposing organization. The proposal Budget Justification should indicate the specifics of the materials and supplies required, including an estimated cost for each item. Items with a total cost exceeding \$5,000 may require pricing documentation (e.g., quote, link to online price list, prior purchase order or invoice) after the proposal is reviewed, as part of the NSF SBIR/STTR Program Director's due diligence efforts. *Please see section VI (NSF SBIR/STTR Phase I Award Considerations) for details.* Companies should provide a detailed itemized list (a table works well) of all materials including item description, quantity, unit price and total price in the Budget Justification, and provide a total that matches the amount in this line (G1).
- **Line G.2 - Publication Costs/Documentation Costs.** Publication Costs/Documentation costs are NOT permitted on a Phase I proposal.
- **Line G.3 - Consultant Services.** Consultant services include specialized work that will be performed by professionals that are not employees of the proposing small business. Purchases of analytical services, other services, or fabricated components from commercial sources should not be listed under consultant services but should instead be reported in the budget under Other Direct Costs/Other (Line G.6). No person who is an equity holder, employee, or officer of the proposing small business may be paid as a consultant unless an exception is recommended by the NSF SBIR/STTR Program Director and approved by the Division Director of Translational Impacts (TI). All activities on an NSF SBIR/STTR project, including services that are provided by consultants, must be carried out in the United States ("United States" means the 50 states, the territories and possessions of the U.S. Federal Government, the Commonwealth of Puerto Rico, the District of Columbia, the Republic of the Marshall Islands, the Federated States of Micronesia, and the Republic of Palau). Guidelines regarding consultant participation include:
 - **Letters of Commitment.** Each consultant, whether paid or unpaid, must provide a signed statement that confirms availability, time commitment, role in the project, and the agreed consulting rate (not to exceed \$1,000 per day; see below). *Provide this letter as part of the Supplementary Documents.* Letters may be uploaded individually or combined into one file.
 - **Consultant Rate.** The consulting rate under this solicitation can be a maximum of \$1,000 per day (NSF defines a day as 8 hours). Consultant travel should be shown under the domestic travel category, E-1, but counts as an outsourcing expense for the purpose of determining whether the small business concern meets the minimum level of effort for an NSF SBIR/STTR proposal.
 - **Biographical Sketch.** Biographical sketches for each consultant may be requested by the NSF SBIR/STTR Program Director after the proposal is reviewed, as part of their due diligence efforts. *Please see section VI (NSF SBIR/STTR Phase I Award Considerations) for details.*
- **Line G.4 - Computer Services.** Funds may be allocated for computer services. Requested services with a total cost exceeding \$5,000 may require pricing documentation (e.g., quote, link to online price list, prior purchase order or invoice) after the proposal is reviewed, as part of the NSF SBIR/STTR Program Director's due diligence efforts. *Please see section VI (NSF SBIR/STTR Phase I Award Considerations) for details.*
- **Line G.5 - Subawards.** Subawards may be utilized when a significant portion of the work will be performed by another organization and when the work to be done is not widely commercially available. Work performed by a university or research laboratory is one example of a common subaward. A subawardee research institution partner is mandatory for STTR proposals. Explicitly list who the research partner will be and provide a brief description of the work they will perform. A minimum of 40% of the research, as measured by the budget, must be performed by the small business concern and a minimum of 30% of the research, as measured by the budget, must be performed by a single subawardee research institution, with the balance permitted to be allocated to either of these, or to other subawards or consultants. Purchases of analytical services, other services, or fabricated components from commercial sources should not be listed under subawards and should instead be reported in the budget under Other Direct Costs/Other (Line G.6). No person who is an equity holder, employee, or officer of the proposing small business may be paid under a subaward unless an exception is recommended by the NSF SBIR/STTR Program Director and approved by the TI Division Director.

Subawards require a separate subaward budget and subaward budget justification, in the same format as the main budget. *Subawardees (the institution, not the individual PI or researcher) should also provide a letter of commitment that confirms the role of the subaward organization in the project and explicitly states the subaward amount. Provide this letter as part of the Supplementary Documents. Multiple letters should be combined as a single PDF before uploading.* For NSF SBIR proposals, subaward funds do not count as funds spent by the small business. The total amount requested for subawards (when added to consultant funds) cannot exceed 1/3 of the total project budget.

Any subrecipients named in a proposal are also required to obtain a SAM UEI and register in Research.gov. Subrecipients named in the proposal, however, do not need to be registered in SAM. Entities can obtain a SAM UEI without full SAM registration. If you have a subrecipient that is not fully registered in SAM, but has been assigned a UEI number, please call the IT Help desk for further assistance.

- **Line G.6 - Other.** This line includes the purchase of analytical services, other services, or fabricated components from commercial sources. Requested services or components with a total cost exceeding \$5,000 may require pricing documentation (e.g. quote, link to online price list, prior purchase order or invoice) after the proposal is reviewed, as part of the NSF SBIR/STTR Program Director's due diligence efforts. *Please see section VI (NSF SBIR/STTR Phase I Award Considerations) for details.*

- **In addition to the above, there are two other activities for which NSF permits the inclusion of additional funds on the G.6 budget line.** The funds noted below may **ONLY** be spent on the commercial or business purposes explicitly permitted below.

1. First, the proposer may budget up to \$10,000 as a direct charge on line G.6 to this Phase I award for the following specific purposes related to financials and accounting:

- Hiring a certified public accountant (CPA) to prepare audited, compiled, or reviewed financial statements;
- Hiring a CPA to perform an initial financial viability assessment based on standard financial ratios so the awardee organization would have time to improve their financial position prior to submitting the Phase II proposal;
- Hiring a CPA to review the adequacy of the awardee's project cost accounting system; and/or
- Purchasing a project cost accounting system.

If the proposer elects to budget funds for one of the above purposes, the Budget Justification should include a brief description of the desired use of funds. The use of funds must be approved by the cognizant NSF SBIR/STTR Program Director prior to award.

2. Second, the proposer may budget up to an additional \$20,000 (\$10,000 if there is no subaward) to cover costs related to the NSF "Beat-the-Odds Boot Camp" which is offered to all SBIR/STTR Phase I awardees. This program is based on the NSF's [Innovation Corps](#) (I-Corps) program. All NSF SBIR/STTR Phase I awardees are strongly encouraged to participate in this activity. The PI and research team of a subaward to a research institution or university are strongly encouraged to participate. If the PI and research team of a subaward to a research institution or university intend to participate, they must separately allocate \$10,000 in direct costs (and therefore the total budget for the Boot Camp would be \$20,000.) Costs that are allowable are limited to travel costs related to customer discovery as part of the Boot Camp (this could include costs associated with registration/attendance at events for the purpose of customer discovery) and salary/wages for team members who participate in the Boot Camp. All costs related to the Boot Camp must be in line with approved salary rates and other relevant Federal guidelines. International travel cannot be reimbursed, nor can any salary/wages for work done while outside of the United States. NSF recommends that, for the purposes of the proposal budget, proposers that plan to participate in this activity simply list these as "Boot Camp" costs in the Budget Justification.

- **Line I - Indirect Costs.** Indirect costs are defined as costs that are necessary and appropriate for the operation of the business, but which are not specifically allocated to the NSF SBIR/STTR project. Common indirect cost expenses include legal and accounting expenses, employee health insurance, fringe benefits, rent, and utilities. If your small business has a Federally negotiated rate, please provide a copy of the negotiated indirect cost rate agreement. If your organization has no negotiated rate with a federal agency, and no previous experience with Federal indirect cost rate negotiation, you may claim (without submitting justification) a total amount of indirect costs (inclusive of fringe benefits) equal to either 50% of total budgeted salary and wages on the project or 10% de minimis on MODIFIED total direct costs on the project. *Modified Total Direct Cost (MTDC): MTDC means all direct salaries and wages, applicable fringe benefits, materials and supplies, services, travel, and up to the first \$25,000 of each subaward (regardless of the period of performance of the subawards under the award). MTDC excludes equipment, capital expenditures, charges for patient care, rental costs, tuition remission, scholarships and fellowships, participant support costs and the portion of each subaward in excess of \$25,000. Other items may only be excluded when necessary to avoid a serious inequity in the distribution of indirect costs, and with the approval of the cognizant agency for indirect costs.*
- **Line K - Small Business Fee.** Up to seven percent (7%) of the total indirect and direct project costs may be requested as a fee (7% of Line J). The fee is intended to be consistent with normal profit margins provided to profit-making firms for R&D work. The fee applies solely to the small business receiving the award and not to any other participant in the project. The fee is not a direct or indirect "cost" item and may be used by the small business concern for any purpose, including additional effort under the NSF SBIR/STTR award (including items on the "Prohibited Expenditures" list below).
- **Prohibited Expenditures (including but not limited to Lines D, E.2, F, and G.2).** Equipment and foreign travel are not allowable expenditures as either direct or indirect costs. However, these expenses may be purchased from the small business fee funds (Line K).

- **Budget Justification(s).** The Budget Justification is uploaded in the Budget Module of Research.gov as a single PDF file. Provide details for each non-zero line item of the budget, including a description and cost estimates. Identify each line item by its letter and number (e.g., G.5 - Subawards). Each non-zero line item should be described in the Budget Justification, but several sections also require more specific information as detailed below. There is a five-page limit each for the Budget Justification. Any letters of commitment from institutions proposed as subawardees in the effort, or individuals proposed as consultants in the effort, should be included in the "Supplementary Documents" section of the proposal, not in the Budget Justification. You can find a sample budget and subaward budget, with justifications, here: <https://seedfund.nsf.gov/apply/full-proposal/>.
 - **Lines A and B - Personnel.** Provide the names and titles of all personnel and a concise description of their responsibilities on the project, including their budgeted time commitment. Provide the actual annual salary information and calculation that justifies the amounts requested.
 - **Line C - Fringe Benefits.** Describe what is included in fringe benefits and the calculations that were used to arrive at the amount requested. It is recommended that proposers allot funds for fringe benefits here ONLY if the proposer's usual (established) accounting practices provide that fringe benefits be treated as direct costs. Otherwise, fringe benefits should be included in Line I (Indirect Costs).
 - **Line E.1 - Domestic Travel.** Describe the purpose for domestic travel and acknowledge attendance at the grantee conference. For trips other than the grantees conference, include the expected number of trips, number of persons traveling, length of each trip, purpose and destination of each trip, and a rough breakdown of the expected cost of each trip.
 - **Line G.1 - Materials and Supplies.** Provide an itemized list of the materials and supplies, with the quantity, unit cost, and total cost for each item. Items with a total line item cost over \$5,000 may require quote or pricing documentation after the proposal has been reviewed, as part of the NSF SBIR/STTR Program Director's due diligence efforts. *Please see section VI (NSF SBIR/STTR Phase I Award Considerations) for details.*
 - **Line G.3 - Consultant Services.** Include a copy of the signed Letter of Commitment in the proposal's "Supplementary Documents" section.
 - **Line G.5 - Subawards.** Include a few sentences describing the scope and objective of the subaward.
 - **Line G.6 - Other.** Any single cost of more than \$5,000 in this line may require pricing documentation (e.g., a quote, past purchase order, link to online price list) after the proposal has been reviewed.
 - **Line I - Indirect Costs.** Provide the calculations that were used to arrive at the amount requested. Please briefly indicate the major cost categories that are included as indirect costs.
 - **Line K - Small Business Fee.** Provide the calculation that was used to arrive at the amount requested.
- **Facilities, Equipment and Other Resources.** Specify the availability and location of significant equipment, instrumentation, computers, and physical facilities necessary to complete the portion of the research that is to be carried out by the proposing firm in Phase I. Purchase of equipment is NOT permitted in a Phase I project. If the equipment, instrumentation, computers, and facilities for this research are not the property (owned or leased) of the proposing firm, include a statement signed by the owner or lessor which affirms the availability of these facilities for use in the proposed research, reasonable lease or rental costs for their use, and any other associated costs. Upload images of the scanned statements into this section.
- **Senior Personnel Documents.** For the Principal Investigator and for each person listed in the "Senior Personnel" section of the proposal, additional documentation is required as below.
 - **Biographical Sketch.** All SBIR/STTR proposals submitted to NSF are required to include Biographical Sketches for each PI, co-PI (if STTR), and Senior Personnel (individuals with critical expertise who will be working on the project and are employed at the proposing company or at a subaward organization) using the format provided [here](#). Biographical sketches are limited to three pages per person.
 - **Current and Pending Support.** Information in this module is collected so that reviewers have visibility into the potential availability of company personnel during the period of performance if awarded. All SBIR/STTR proposals submitted to NSF are required to include Current and Pending Support for each PI, co-PI (if STTR), and Senior Personnel using the form found [here](#). Step-by-step guidance can also be found <https://seedfund.nsf.gov/apply/full-proposal/>.
 - **Types of Support / Activities.** For the PI, co-PI (if STTR), and each of the Senior Personnel listed on line A or B of the budget, provide information regarding each of the following that could commit this person to a required level of effort during the proposed Phase I performance period, regardless of whether the person will receive a salary from the activity:
 - All current and pending support for ongoing projects and proposals (from any source, including in kind support or equity investment), including continuing grant and contract funding.
 - Proposals submitted to other agencies. Concurrent submission of a proposal to other organizations will not influence the review of the proposal submitted to NSF.
 - Upcoming submissions.
 - **The Phase I proposal being submitted is considered "pending" and therefore MUST appear in the Current and Pending Support form for each PI and Senior Personnel.**
 - **Information Needed.** For each listed item, please include the following information:
 - Name of sponsoring organization.

- Total award amount (if already awarded) or expected award amount (if pending) for the entire award period covered (including indirect costs).
 - Title and performance period of the proposal or award.
 - Annual person-months (calendar months) devoted to the project by the PI or senior personnel.
- **Collaborators & Other Affiliation Information** (Single Copy Document): For the PI and each of the Senior Personnel, list all institutional affiliations (other employers, consulting relationships, officer/director/trustee roles, etc.) and collaborators (co-authors, scientific partners, student/advisor relationships) that have occurred in the last four years, using the instructions and spreadsheet template found at <https://www.nsf.gov/bfa/dias/policy/coa.jsp>. This document will not be viewable by reviewers but will be used by NSF to manage the selection of reviewers. Also see guidance in the PAPPG.
- **Data Management Plan (required)**. Proposals MUST contain a supplementary document labeled "Data Management Plan (DMP)", which should include the statement, "All data generated in this NSF SBIR/STTR Phase I project is considered proprietary." This single sentence is sufficient to fulfill the DMP requirement, but proposers may add more detail about how the resulting data will be managed if they desire.
- **Postdoctoral Mentoring Plan (Conditionally required)**. If a proposal requests funding to support post-doctoral scholars at a research institution (through a subaward), a Postdoctoral Mentoring Plan MUST be uploaded to the system. Describe only the mentoring activities that will be provided to all postdoctoral researchers supported by the project. See more information and instructions on this requirement in the PAPPG.
- **Optional. Note: Various subsections are REQUIRED depending on the type of proposal (SBIR or STTR), whether the company has a commercialization history, whether the proposal is a resubmission, etc.) Please read section requirements carefully.**
 - **Letter(s) of Support (Strongly recommended)**. Letters of Support act as an indication of market validation for the proposed innovation and add significant credibility to the proposed effort. No more than three letters of support should be used to demonstrate that the company has initiated dialogue with relevant stakeholders (e.g., potential customers, strategic partners or investors) for the proposed innovation and that a legitimate business opportunity may exist should the technology prove feasible. The letter(s) must contain affiliation and contact information for the signatory stakeholder. Letters of commitment and supporting documents from consultants and subcontractors (or any personnel identified in the Budget Justification) are NOT considered letters of support.
 - **Cooperative Research Agreement (Required for STTR only)**. See the model [Cooperative Research Agreement \(CRA\)](#). The proposing small business concern must provide a signed CRA between the small business and the research institution prior to award. For proposal submission, place a draft of the CRA or a letter that includes the STTR partner research institution stating that a CRA will be provided upon notification of award recommendation.
 - **Other Personnel Biographical Information (Strongly recommended)**. This optional section can be used to provide additional biographical information about project participants who are not listed as senior personnel for the small business or for a subawardee as well as Letters of Support. Documents must use the format provided in the PAPPG instructions. Biographical sketches are limited to three pages per person.
 - **Other Supplementary Documents**. The required supplementary documents of an NSF SBIR/STTR Phase I proposal are limited to the following (if applicable).
 - **Company Commercialization History (Required, if applicable)**. A Company Commercialization History is required for all proposers certifying receipt of previous Phase II SBIR/STTR awards from any Federal agency on the third page of the Cover Sheet in question #11. The [NSF Commercialization History Template](#) MUST be used. All items must be addressed in the format outlined in this template. Changes to the NSF template, additional narratives and/or commercialization history documents from other agencies are not permitted.
 - **Letters of Commitment from Subawardees and Consultants (Strongly recommended)**. Please refer to section V.A.C "Budget and Subaward Budgets" for details.
 - **Resubmission Change Description (Required, if applicable)**. A declined proposal may be resubmitted, but only after it has undergone substantial revision and only with the receipt of a new invited Project Pitch. A resubmitted proposal that has not clearly taken into account the major comments or concerns resulting from the prior NSF review may be Returned Without Review. The Foundation will treat the revised proposal as a new proposal, subject to the standard review procedures. A Phase I proposing company must indicate on the Cover Sheet that the proposal is a resubmission, and the proposal must include a one-page maximum document in the Other Supplementary Documents module detailing the substantial revisions that have been made to the original submission.
- **List of Suggested Reviewers (Single Copy Document)**. This section can be used to suggest the names of reviewers who might be appropriate to assess the technical and commercial merits of the proposal. Reviewers who have significant personal or professional relationships with the proposing small business or its personnel will should generally not be included. As a Single Copy Document, this information will not be shared with reviewers and/or panelists.
- **List of Reviewers Not to Include (Single Copy Document)**. This section can be used to suggest names (or even specific affiliations) of reviewers that the proposer prefers not be involved in the review of their proposal. As a Single Copy Document, this information will not be shared with reviewers and/or panelists.

- **Deviation Authorization (Single Copy Document).** This section should generally not be used unless NSF staff have specifically instructed the proposer to do so. As a Single Copy Document, this information will not be shared with reviewers and/or panelists.
- **Additional Single Copy Documents (required).** In this section, proposers must submit a copy of the email invitation from an NSF SBIR/STTR Program Director – in response to a submitted Project Pitch – inviting the company to submit a full proposal. Please convert this invitation email to a PDF before uploading.

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 for further information.

C. Due Dates

- **Submission Window Date(s)** (due by 5 p.m. submitter's local time):

November 22, 2022 - March 01, 2023

March 02, 2023 - July 05, 2023

July 06, 2023 - November 01, 2023

D. Research.gov Requirements

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

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

The NSF SBIR/STTR program has an additional criterion, Commercial Impact, to reflect the emphasis on commercialization and complement the standard NSF review criteria listed above. Commercial impacts (both economic and otherwise) for the NSF SBIR/STTR program focuses on the potential of the activity to lead to significant outcomes in the commercial market. The following criteria should be applied in the review of this criterion:

- Is there a significant market opportunity that could be addressed by the proposed product, process, or service?
- Does the company possess a significant and durable competitive advantage, based on scientific or technological innovation, that would be difficult for competitors to neutralize or replicate?
- Is there a compelling potential business model?
- Does the proposing company/team have the essential elements, including expertise, structure, and experience, that would suggest the potential for strong commercial outcomes?
- Will NSF support serve as a catalyst to improve substantially the technical and commercial impact of the underlying commercial endeavor?

NSF SBIR/STTR Phase I Award Considerations

Once the panel and/or ad hoc review of an individual NSF SBIR or STTR Phase I proposal has concluded and the proposal is considered potentially meritorious, a follow-on due diligence process may be conducted in which the Principal Investigator will be asked to provide additional information and/or to answer questions specific to their proposal in order to inform the final decision.

NSF SBIR Phase I proposals submitted to this solicitation which are considered meritorious and which meet all the requirements of the NSF STTR Phase I program may, based on budgetary considerations and at NSF's discretion, be considered for award as an NSF STTR Phase I projects. If recommended for an NSF STTR Phase I award, the small business proposer will need to complete a [Cooperative Research Agreement \(CRA\)](#) between the small business and the research institution prior to award. NSF may also, at its discretion, convert NSF STTR Phase I proposals to NSF SBIR Phase I proposals; the award mechanism for either will be a fixed price grant.

NSF requires each NSF SBIR/STTR Phase I awardee company to attend and participate in the NSF SBIR/STTR Phase I Awardees Workshop.

Debriefing on Unsuccessful Proposals. When a proposal is declined, verbatim copies of reviews (excluding the names, institutions, or other identifying information of the reviewers), summaries of review panel conclusions, if any, and a description of the process by which the proposal was reviewed (Process Statement) will be available electronically in

Research.gov. Phase I proposals that have been declined by NSF are NOT eligible for reconsideration (please refer to NSF PAPPG). Declined NSF SBIR/STTR Phase I proposals are also NOT eligible for resubmission in the same submission window in which they were declined. A proposer of a previously declined proposal must submit a new Project Pitch and, if invited, submit a new proposal after substantial revision, to be explicitly noted at submission. Proposals Returned Without Review may be corrected for solicitation compliance issues and resubmitted with the same invited Project Pitch (within one year of the initial Project Pitch invite).

B. Review and Selection Process

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

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

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

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

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

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

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

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

Administrative and National Policy Requirements

Build America, Buy America

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

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

Special Award Conditions:

NSF SBIR/STTR awardees are subject to the Small Business Innovation Research/Small Business Technology Transfer Phase I Grant General Conditions (SBIR-I) dated 05/13/2022. These documents may be accessed electronically on NSF's Website at https://www.nsf.gov/bfa/dias/policy/sbir/sbiri_0522.pdf.

SBIR/STTR Funding Agreement Certification:

SBIR/STTR prospective grantees will be notified by NSF to provide a signed SBIR/STTR Funding Agreement Certification. The Federal government relies on the information provided by grantees to determine whether the business is eligible for an SBIR or STTR Program award. Certification will be used to ensure continued compliance during the life of the funding agreement (https://seedfund.nsf.gov/assets/files/awardees/SBIR_STTR_Funding_Agreement.pdf).

NSF SBIR/STTR Statement on Harassment:

The PI and any co-PI(s) identified on an NSF award are in a position of trust. These individuals must comport themselves in a responsible and accountable manner during the award period of performance, including but not limited to the following environments: the lab, online, or at locales such as field sites, facilities, customer discovery sites, or conferences/workshops. All personnel supported by an NSF award must remain in full compliance with grantee policies and/or codes of conduct, statutes, regulations, or executive orders relating to sexual harassment, other forms of harassment, or sexual assault.

Fraud, Waste, and Abuse (FWA) Notification:

The Office of Inspector General (OIG) maintains a Hotline to receive this information, which can be reached at <https://oig.nsf.gov/contact/hotline>. Disclosures can also be made via an anonymous phone line at (800) 428-2189. Upon request, OIG will take appropriate measures to protect the identity of any individual who reports misconduct, as authorized by the Inspector General Act of 1978, as amended. Reports to OIG may be made anonymously.

The mailing address of OIG is 2415 Eisenhower Ave, Alexandria, VA 22314 ATTN: OIG HOTLINE.

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.

The only required deliverable of an NSF SBIR/STTR Phase I award is a report describing the technical accomplishments and outcomes of the Phase I project. The Phase I final report will be due to NSF **within 15 days following the end date of the award** and is limited to 15 pages in length. A Phase II proposal requires a Phase I technical report to be uploaded as part of the Phase II proposal package in Research.gov. If the Phase II proposal is submitted prior to the completion of the Phase I award, an interim Phase I technical report may be uploaded as part of the Phase II proposal package in Research.gov. Please see more details [here](#).

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:

- Henry Ahn, telephone: (703) 292-7069, email: hahn@nsf.gov
- Peter S. Atherton, telephone: (703) 292-8772, email: patherto@nsf.gov
- Anna S. Brady-Estevez, telephone: (703) 292-7077, email: abrady@nsf.gov
- Edward Chinchoy, telephone: (703) 292-7103, email: echincho@nsf.gov
- Parvathi Chundi, telephone: (703) 292-5198, email: pchundi@nsf.gov
- Samir M. Iqbal, telephone: (703) 292-7529, email: smiqbal@nsf.gov
- Rajesh V. Mehta, telephone: (703) 292-2174, email: rmehta@nsf.gov
- Elizabeth Mirowski, telephone: (703) 292-2936, email: emirowsk@nsf.gov
- Alastair Monk, telephone: (703) 292-4392, email: amonk@nsf.gov
- Muralidharan S. Nair, telephone: (703) 292-7059, email: mnair@nsf.gov
- Erik Pierstorff, telephone: (703) 292-2165, email: epiersto@nsf.gov
- Benaiah D. Schrag, telephone: (703) 292-8323, email: bschrag@nsf.gov

For questions related to the use of NSF systems contact:

- NSF Help Desk: 1-800-673-6188
- 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) 292-8143
- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

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

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

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