

# Small Business Technology Transfer (STTR) Program Phase I

---

## PROGRAM SOLICITATION NSF 21-563

---

### REPLACES DOCUMENT(S): NSF 20-528

---



National Science Foundation  
Directorate for Engineering  
Industrial Innovation and Partnerships

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

February 12, 2021 - March 04, 2021

March 05, 2021 - June 03, 2021

June 04, 2021 - September 02, 2021

September 03, 2021 - January 06, 2022

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 one of the submission windows listed above (up to one year).

## IMPORTANT INFORMATION AND REVISION NOTES

---

The NSF SBIR/STTR program has extended the solicitation window closing date for both NSF SBIR and STTR Phase I and Phase II solicitations from **December 2, 2021, to January 6, 2022.**

NSF SBIR/STTR Phase I and Phase II applicants will still need to submit their proposals according to the eligibility criteria outlined in the NSF SBIR/STTR Phase I and Phase II solicitations. Please refer to the email sent on 11/30/2021 for more details or contact [sbir@nsf.gov](mailto:sbir@nsf.gov) with any questions.

NSF Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Program Phase I proposers are **REQUIRED to submit a three-page "Project Pitch"** that outlines the project objectives, technological innovation and associated technical risks. **A small business must receive an official invitation via the Project Pitch process to submit a full proposal to this solicitation.** The Project Pitch gives NSF the ability to review for appropriateness to the NSF SBIR/STTR Phase I program prior to the full proposal submission process, ensuring that proposers do not expend time or resources preparing full proposals that are clearly not aligned with the solicitation requirements. Details regarding this process as well as how to submit a Project Pitch can be found in section V.A of this document.

The NSF SBIR/STTR Program has **four submission windows**, as opposed to specific deadlines, that allow small businesses the flexibility to submit a full proposal at any time within the year. *Please refer to specific quarterly window dates listed at the top of this document. The proposal submission system (FastLane) will shut down at 5:00 p.m. "proposer's time" on each submission window closing date, but, with the exception of the final submission window which closes in December, the system will then reopen for new submissions the following morning.*

The NSF SBIR/STTR Program provides non-dilutive funding for the development of **deep technologies**, based on discoveries in fundamental science and engineering for profound societal impacts, and welcomes the submission of Project Pitches and full proposals (from companies invited to submit) in many [technical areas](#).

Proposals submitted to this solicitation that meet all the requirements of the concurrent SBIR solicitation and are identified meritorious may, based on budgetary considerations and at NSF's discretion, be considered for award as SBIR Phase I proposals.

NSF proposals are 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. Proposals to NSF do not constitute a public disclosure. If selected for a Phase I award, a company will be prompted to write a project summary and an abstract that summarizes the intellectual merit and broader impact for the public.

**Effective October 5, 2020, NSF requires all proposals (including SBIR/STTR proposals) to include Biographical Sketches and Current and Pending Support documents using NSF-approved formats.** A proposal without the Biographical Sketches and Current and Pending Support documents in the NSF-approved format will be Returned without Review. For SBIR or STTR proposals submitted to NSF, please follow the guidance provided in Section V.A of this solicitation (Proposal Preparation and Submission Instructions) for both Biographical Sketches and Current and Pending Support documentation. Step-by-step guidance can also be found [here](#).

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 Guide \(PAPPG\)](#) Introduction, Section D ("Definitions & NSF-Grantee 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**: As noted in the SBA SBIR/STTR Policy Directive, 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 § 200.8, 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 adequate resources to carry out the applications and novel integration of new theories, analysis, data, or methods regarding cognition, heuristics, and related phenomena.
- **Deep Technologies**: technologies based on discoveries in fundamental science and engineering.
- **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. 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 \(PAPPG\)](#).

## SUMMARY OF PROGRAM REQUIREMENTS

---

### General Information

---

#### Program Title:

Small Business Technology Transfer (STTR) Program Phase I

#### Synopsis of Program:

##### Introduction to the Program:

The NSF STTR program focuses on transforming 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 STTR program supports the creation of opportunities to move fundamental science and engineering out of the lab and into the market or other use at scale, or startups and small businesses representing "deep technology ventures."

The NSF STTR Program funds research and development. The program is designed to provide non-dilutive funding and entrepreneurial support at the earliest stages of company and technology development.

#### Synopsis of Program:

The STTR program is intended to support scientific excellence and technological innovation that is moving from the lab to the market. By investing federal research and development funds into 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; 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 STTR program at NSF solicits proposals based on groundbreaking scientific discoveries or significant engineering breakthroughs from the small businesses 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.

The program is governed by [Public Law 114-328](#) (SBIR/STTR Reauthorization Act of 2017). SBIR/STTR policy is provided by the Small Business Administration (SBA) through the [SBIR/STTR Policy Directive](#).

The NSF SBIR/STTR program welcomes proposals from many topics and does not have a specific topical or procurement focus. The topics are detailed on the program [website](#). The program is also open to proposals focusing on technical and market areas not explicitly noted in the aforementioned topics.

#### 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, Biomedical (BM) Technologies and Medical Devices (MD), telephone: (703) 292-7069, email: [hahn@nsf.gov](mailto:hahn@nsf.gov)
- Peter Atherton, Advanced Analytics (AA); Artificial Intelligence (AI); Cloud and High-Performance Computing (CH); Cybersecurity and Authentication

- (CA); and Quantum Information Technologies (QT), telephone: (703) 292-8772, email: [patherto@nsf.gov](mailto:patherto@nsf.gov)
- Anna Brady-Estevez, Chemical Technologies (CT); Energy Technologies (EN); and Distributed Ledger (DL), telephone: (703) 292-7077, email: [abrady@nsf.gov](mailto:abrady@nsf.gov)
- Kaitlin Bratlie, Pharmaceutical Technologies (PT), telephone: (703) 292-2638, email: [kbratlie@nsf.gov](mailto:kbratlie@nsf.gov)
- Diane Hickey, Augmented and Virtual Reality (AV); Learning and Cognition Technologies (LC); and Human-Computer Interaction (HC), telephone: (703) 292-8875, email: [dhickey@nsf.gov](mailto:dhickey@nsf.gov)
- Steven Konsek, Advanced Materials (AM); Power Management (PM); Nanotechnology (N); Semiconductors (S); Photonics (PH); and Other Topics (OT), telephone: (703) 292-7021, email: [skonsek@nsf.gov](mailto:skonsek@nsf.gov)
- Rajesh Mehta, Environmental Technologies (ET), telephone: (703) 292-2174, email: [rmehta@nsf.gov](mailto:rmehta@nsf.gov)
- Elizabeth Mirowski, Advanced Manufacturing (M) and Mobility (MO), telephone: (703) 292-2936, email: [emirowsk@nsf.gov](mailto:emirowsk@nsf.gov)
- Alastair Monk, Digital Health (DH), telephone: (703) 292-4392, email: [amonk@nsf.gov](mailto:amonk@nsf.gov)
- Muralidharan S. Nair, Internet of Things (I); Robotics (R); Space Technologies (SP); and Wireless Technologies (W), telephone: (703) 292-7059, email: [mnair@nsf.gov](mailto:mnair@nsf.gov)
- Erik Pierstorff, Biological Technologies (BT), telephone: (703) 292-2165, email: [epiersto@nsf.gov](mailto:epiersto@nsf.gov)
- Benaiah D. Schrag, Instrumentation and Hardware Systems (IH), telephone: (703) 292-8323, email: [bschrag@nsf.gov](mailto: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 --- Education and Human Resources
- 47.079 --- Office of International Science and Engineering
- 47.083 --- Office of Integrative Activities (OIA)

## Award Information

---

**Anticipated Type of Award:** Fixed Amount Grant

**Estimated Number of Awards:** 60 (per year, pending the availability of funds)

**Anticipated Funding Amount:** \$15,000,000

For STTR Phase I per year, pending 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 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 (RI) in the project, see additional details below. **AND**
- Firms 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, 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.*

#### Who May Serve as PI:

The primary employment of the PI must be with the small business concern 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, as long as 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 STTR Phase I project.

#### Limit on Number of Proposals per Organization: 1

An organization may submit only one invited STTR Phase I proposal per quarterly submission window (e.g., March 5 - June 3, 2021). An organization must wait for a determination from NSF (e.g., Award, Declination, or Return without Review) on any NSF SBIR/STTR Phase I pending proposal before submitting a new proposal in the next quarterly window. This eligibility constraint will be strictly enforced. In the event that an organization exceeds this limit, the first proposal received will be accepted, and the remainder will be Returned without Review. Declined proposals require a new invited Pitch while proposals Returned without Review may be submitted using the same invited Pitch (within the one-year eligibility from date of the original proposal invitation). Submission of an invited STTR Phase I full proposal in a given submission window precludes that organization from submitting a proposal to the concurrent SBIR Phase I solicitation.

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

1 (PI), no limit (co-PI)

An individual may be listed as the PI for only one proposal submitted to this solicitation or the concurrent NSF SBIR Phase I solicitation. There is no limit as to the number of proposals for which a given person may act as the co-PI.

## Proposal Preparation and Submission Instructions

---

### A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposal Submission:** Not required
- **Full Proposal Preparation Instructions:** 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 this 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):
  - February 12, 2021 - March 04, 2021
  - March 05, 2021 - June 03, 2021
  - June 04, 2021 - September 02, 2021
  - September 03, 2021 - January 06, 2022

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 one of the submission windows listed above (up to one year).

## 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.

## TABLE OF CONTENTS

---

### Summary of Program Requirements

- I. [Introduction](#)
- II. [Program Description](#)
- III. [Award Information](#)
- IV. [Eligibility Information](#)
- V. [Proposal Preparation and Submission Instructions](#)
  - A. [Proposal Preparation Instructions](#)
  - B. [Budgetary Information](#)
  - C. [Due Dates](#)
  - D. [FastLane Requirements](#)

- VI. **NSF Proposal Processing and Review Procedures**
  - A. Merit Review Principles and Criteria
  - B. Review and Selection Process
- VII. **Award Administration Information**
  - A. Notification of the Award
  - B. Award Conditions
  - C. Reporting Requirements
- VIII. **Agency Contacts**
- IX. **Other Information**

## I. INTRODUCTION

---

The NSF STTR program focuses on transforming scientific discovery into commercial potential and/or societal benefit through the development of products or services. Unlike fundamental or basic research activities which focus on scientific and engineering discovery itself, the NSF STTR program supports startups and small businesses in technological innovation, that is, the creation of opportunities to move fundamental science and engineering out of the lab and into the market.

The NSF STTR Program funds research and development. The program is designed to provide non-dilutive funding and entrepreneurial support at the earliest stages of company and technology development.

By investing federal research and development funds into 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; 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 SBIR/STTR Programs at NSF have no specific topical or procurement focus. Generally, the topics included in NSF SBIR and STTR solicitations are broad to permit as many eligible science- and engineering-based small businesses as possible to compete for funding. By doing so, these programs meet the purpose of the SBIR/STTR legislation by transforming science and engineering discovery and innovation into both social and economic benefit, by emphasizing private sector commercialization.

SBIR/STTR awards are not traditional government contracts. They are not awarded in order to procure services or goods for the government. No tangible benefit is received by the government.

Annual project reports are provided to NSF by the awardee as part of an oversight mechanism to ensure that the company is properly spending the funds received on research, as proposed. NSF does not purchase these annual project reports and does not benefit from or otherwise use these reports. NSF does not test, verify, or otherwise use the technology developed under its SBIR/STTR awards.

The SBIR/STTR Phase I Programs are highly competitive. While success rates vary year-to-year, approximately 10-15% of the full 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 STTR Program encourages small businesses to submit proposals across all areas of science and engineering (with the exception of proposals requiring clinical trials).

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 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.**

**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 § 200.8, 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 *adequate resources* to carry out the applications and novel integration of new theories, analysis, data, or methods regarding cognition, heuristics, and related phenomena.

Inherent in the Intellectual Merits of the proposal are the **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. 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.

**Broader Impacts** criterion encompasses the potential benefit to society and contribution to the achievement of specific, desired societal outcomes. Proposers should consider the American Innovation and Competitiveness Act (P.L. 114-329, [Section 102](#)) Broader Impacts Review Criterion Update:

1. Increasing the economic competitiveness of the United States.
2. Advancing of the health and welfare of the American public.
3. Supporting the national defense of the United States.
4. Enhancing partnerships between academia and industry in the United States.
5. 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.
6. Improving public scientific literacy and engagement with science and technology in the United States.
7. Expanding participation of women and individuals from underrepresented groups in STEM.

**Commercialization Potential** of the proposed product or service has the potential 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).

#### **Administrative Requirements:**

In addition to the eligibility requirements outlined in Section IV, submission of a full proposal requires that the proposer:

- **Register in the System for Award Management (SAM), Research.gov, and SBIR.gov. To register with SAM, the small business must have a valid DUNS number. These registrations take time, so we recommend starting several weeks or a month prior to the proposal deadline; see section V.A.B for details.**

For more in-depth program information please reference the [program's website](#) and the solicitation-specific Merit Review Criteria in section VI.

### **III. AWARD INFORMATION**

---

Phase I proposals may be submitted for up to \$256,000 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.

### **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 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 (RI) in the project, see additional details below. **AND**
- Firms 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, proposers must submit a Project Pitch document and receive an official response (via email) from the cognizant Program Director. *Please see section section V.A for details.*

#### **Who May Serve as PI:**

The primary employment of the PI must be with the small business concern 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, as long as 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 STTR Phase I project.

#### **Limit on Number of Proposals per Organization: 1**

An organization may submit only one invited STTR Phase I proposal per quarterly submission window (e.g., March 5 - June 3, 2021). An organization must wait for a determination from NSF (e.g., Award, Declination, or Return without Review) on any NSF SBIR/STTR Phase I pending proposal before submitting a new proposal in the next quarterly window. This eligibility constraint will be strictly enforced. In the event that an organization exceeds this limit, the first proposal received will be accepted, and the remainder will be Returned without Review. Declined proposals require a new invited Pitch while proposals Returned without Review may be submitted using the same invited Pitch (within the one-year eligibility from date of the original proposal invitation). Submission of an invited STTR Phase I full proposal in a given submission window precludes that organization from submitting a proposal to the concurrent SBIR Phase I solicitation.

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

1 (PI), no limit (co-PI)

An individual may be listed as the PI for only one proposal submitted to this solicitation or the concurrent NSF SBIR Phase I solicitation. There is no limit as to the number of proposals for which a given person may act as the co-PI.

#### **Additional Eligibility Info:**

**Required Project Pitch submission: Potential proposers must receive an invitation to submit a full NSF STTR Phase I proposal.** To start this process, proposers must first create a log in and submit a Project Pitch document via the NSF SBIR/STTR Phase I Project Pitch [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 the proposer small business include an eligible research institution as a subawardee on the project budget. The STTR partner 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 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 the 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 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 the 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.

**Ownership and Venture Capital, Joint Ventures.** NSF does not fund proposals from companies that are majority-owned by one or more venture capital operating companies (VCOCs), 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 the [Guide to SBIR/STTR Program Eligibility](#) for more information).

#### **Government-Wide Required Benchmarks: (Applies to previous SBIR/STTR award winners ONLY)**

**Phase I to Phase II Transition Rate Benchmark.** For Phase I proposers that have received more than 20 Phase I Federal SBIR/STTR awards 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 who fail to meet this transition requirement will be notified by SBA and will not be eligible to submit a Phase I proposal for one year from the June 1<sup>st</sup> 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](#). Firms for which the commercialization benchmark applies should consult [SBIR.gov](#) for more information.

More information on both of the above benchmarks can be found [here](#).

## **V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS**

---

### **A. Proposal Preparation Instructions**

---

**Full Proposal Instructions:** Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the guidelines specified in the *NSF Proposal & Award Policies & 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](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](mailto:nsfpubs@nsf.gov).

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

***This solicitation contains the information needed to prepare a proposal and refers to specific sections of the PAPPG only when necessary. The instructions in this solicitation take precedence over instructions in the PAPPG in the event of a conflict.***

**Program Objectives:** The NSF SBIR/STTR Program Objectives are to support **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 NSF SBIR/STTR Phase I Project Pitch [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 Objectives.

- Proposers are encouraged to submit a Project Pitch at any time, regardless of the SBIR/STTR Phase I solicitation windows.
- 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.
- The cognizant NSF SBIR/STTR Program Director 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 the open Phase I SBIR or STTR 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 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 quarterly 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 a small business with a pending Project Pitch will not be reviewed nor invited.
- A small business receiving an invitation to submit a full proposal must wait for that proposal to be submitted and resolved before submitting another Project Pitch.
- Potential proposers who do not receive an invitation to submit a proposal are not eligible to apply for Phase I funding. **Proposals submitted without a Project Pitch invitation will be Returned without Review.**

The NSF SBIR/STTR program only funds **Research and Development (R&D)** activities, as broadly defined in 2 CFR § 200.87, but specified for the NSF SBIR/STTR program as follows:

- the application of *creative, original and potentially transformative science and engineering concepts* to small businesses that propose 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 small businesses based on *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 in their small business; and/or
- the demonstration of *adequate resources* to carry out the applications and novel integration of new theories, analysis, data, or methods regarding cognition, heuristics, and related phenomena.

Inherent in R&D is **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. 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.

An 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. The only required deliverable of an STTR Phase I grant is a report describing the technical accomplishments and outcomes of the Phase I project.

#### **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 research and drug development efforts are not considered in this solicitation.

#### **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, rather than straightforward engineering or incremental product development tasks.
- Up to 250 words describing the customer profile and unmet needs 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.

*Note that NSF's Beat The Odds Boot Camp activity represents an exception to the aforementioned restrictions; see section V.D.6 ("Award and Subaward Budgets") for more details.*

Non-responsive proposals may be Returned without Review. Phase I proposals Returned without Review by NSF are NOT eligible for review again in the same quarterly submission window. A Phase I proposal Returned without Review may be submitted in a subsequent submission window if: 1) the 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 a Phase I award, you will be prompted to write a project summary and description of intellectual merit and broader impact for the public.

SBIR/STTR data, including proposals, are protected from disclosure by the participating agencies for not less than twenty 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.

**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 (Context Statement) will be available electronically. Phase I proposals that have been declined by NSF are NOT eligible for reconsideration (please refer to Chapter IV.D.2.b of the NSF PAPPG). Declined NSF SBIR/STTR Phase I proposals are also NOT eligible for resubmission in the same quarterly submission window in which it was 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 Pitch (within one year of the initial Pitch invite).

**Proposal Format and Sample Limitations.** Samples, videotapes, slides, appendices, or other ancillary items are not allowed within a proposal submission. Websites containing demonstrations, etc., may be cited in the proposal Reference Section, but reviewers are not required to access them. Please refer to the NSF PAPPG (Chapter II, Section B) and Section V.C of this solicitation for more details on accepted proposal fonts and format.

#### A. Registrations

Small businesses applying for NSF 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 to complete, 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:

1. **Dun and Bradstreet Data Universal Numbering System (DUNS).** In accordance with the Office of Management and Budget policy directive 75 FR 22706, each proposer must have a DUNS number prior to submission of a proposal to NSF. Any subawardees named in the proposal must be registered in Research.gov, which also requires the organization's DUNS number (<https://www.dnb.com/duns-number/get-a-duns.html>).
2. **System for Award Management (SAM) Registration.** Each applicant small business (excluding subawardees) must register their company within the System for Award Management (SAM) prior to registering their company in Research.gov. The SAM is the primary registrant database for entities to do business with the U.S. Government. This SAM registration must be maintained with current information while the organization has a proposal under consideration at NSF or has an active award. To register in SAM, go to <https://www.sam.gov/>.
3. **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 application submission and update the SBC if any information changes prior to award.
4. **Research.gov:** For more information, consult the "About Account Management" page at <http://www.research.gov/>.

#### B. Tips on the Proposal Preparation and Submission

For more detailed help in preparing and submitting an invited full proposal via the NSF FastLane system, please see the [SBIR/STTR FastLane Submission Guide](#). Failure to comply with the below guidelines means that a proposal may be Returned without Review. While FastLane permits uploads of several different file formats, PDF is strongly recommended. It is suggested that you create a single PDF document for each section of the proposal, aggregate those PDF documents into a single file joining the various sections, then upload this single PDF to FastLane. This will avoid issues resulting from FastLane conversion to PDF formats.

- **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** upload the email invitation 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 FastLane system allows a proposal to be submitted without these items, ALL proposals must have each of the items listed below, WITHOUT EXCEPTION.
  - [Project Summary](#)
  - [Project Description](#)
  - [References Cited](#)
  - [Biographical Sketches](#)
  - [Budget and Subaward Budgets](#)
  - [Budget Justification](#)
  - [Current and Pending Support](#)
  - [Collaborators and Other Affiliations](#)
  - [Facilities, Equipment and Other Resources](#)
  - [Supplementary Documents \(all that are applicable\)](#)
- **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 (FastLane) 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. Proposer's time zone is set by the company in the organization registration area of Research.gov.
- **DO NOT** submit a Project Description that is more than 15 pages long.
- **DO NOT** submit a Budget exceeding \$256,000. 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 FastLane). 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 9 pages for the Project Description document to provide sufficient detail on the key technical 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 FastLane 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 except those described in [Supplementary Documents](#).

### C. Detailed Instructions on Invited Proposal Preparation

1. **Cover Sheet and Certification.** Complete topic and subtopic fields should be included on the Cover Sheet. Designate one, and only one, topic and subtopic. If a proposer fails to disclose on the proposal Cover Sheet whether another Federal Agency has received this proposal (or an equivalent or overlapping proposal), the proposer could be liable for administrative, civil or criminal sanctions. NSF will not make awards that duplicate research funded or expected to be funded by other agencies, although in some cases NSF may fund portions of work described in an overlapping proposal, provided that the budgets are appropriately reduced and allocated among the various sponsors. *NOTE: To save your data, be sure to click the "OK" button at the bottom of the screen prior to navigating away from the Cover Sheet. If you receive any error messages when you click "OK", you must clear all errors and re-click "OK" to save the data.*
2. **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 FastLane or will be Returned without Review. The Project Summary is completed in FastLane by entering information into the three text boxes in the Project Summary module. **Information MUST be entered into all three text boxes, or the proposal will not be accepted. Do not upload your Project Summary as a PDF file.**

- **Box 1: Overview, Key Words, and Subtopic Name:** 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.
  - **Box 2: Intellectual Merit:** This section MUST begin with "This 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.
  - **Box 3: Broader Impact and Commercial Potential:** 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. Please also discuss potential broader societal impacts of the innovation (e.g. educational, environmental, scientific, societal, or other impacts on the nation and the world).
3. **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 SBIR/STTR Program Director that your 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 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. This section may contain information excluded from the Project Summary because of the proprietary nature. Which aspects are original, unusual, novel, disruptive, or transformative compared to the current state of the art?

#### The Commercial Opportunity (recommended length: 2-4 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: 1-3 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."
- 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 with award number ". Please contact the host organization for the relevant award number.

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

- o 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?
- o Describe your vision for the company and the company's expected impact over the next five years.
- o If the company has existing operations, describe how the proposed effort would fit into these activities.
- o Describe the revenue history, if any, for the past three years. Include and explicitly state government funding and private investment in this discussion.
- o 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)**

- o Describe the innovation in sufficient technical detail for a knowledgeable reviewer to understand why it is innovative and how it can provide benefits in the target applications. Supplement this description with any necessary background information.
- o 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.
- o Describe the critical technical milestones that must be met to get the product or service to market.
- o Present an R&D plan, with timeline. What are the objectives, and what experiments, computations, 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 page)**

- o 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. In addition, proposers should take into account the American Innovation and Competitiveness Act (P.L. 114-329, Section 102) Broader Impacts Review Criterion update:
  1. *Increasing the economic competitiveness of the United States.*
  2. *Advancing of the health and welfare of the American public.*
  3. *Supporting the national defense of the United States.*
  4. *Enhancing partnerships between academia and industry in the United States.*
  5. *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.*
  6. *Improving public scientific literacy and engagement with science and technology in the United States.*
  7. *Expanding participation of women and individuals from underrepresented groups in STEM.*
- 4. **References Cited.** Provide a comprehensive listing of relevant references, including 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.
- 5. **Biographical Sketches. Effective October 5, 2020, all proposals submitted to NSF are required to include Biographical Sketches for each PI 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 an NSF-approved format.** NSF SBIR and STTR proposers must include this form as part of their proposal submission, however, they may choose to either (1) submit the NSF Biographical Sketches form with all fields completed or (2) submit a partially completed form and upload resumes (following the format provided in the next paragraph) as Supplemental Documents. Step-by-step guidance can also be found [here](#). Biographical sketches are limited to two pages per person. Biographical Sketches or resumes of consultants should be provided in this format, but uploaded as part of the Budget Justification.

Provide a resume for the PI and Senior Personnel. Do not include personal information, such as home address or personal cell phone numbers, in Biographical Sketches. Provide information in the following sections: **(I) Education:** Institution, Location, Major/Concentration, Degree, and Year. **(II) Relevant Experience:** Include technical and/or commercial experience. List in reverse chronological order beginning with the current position. **(III) Products:** Includes patents, publications, etc. List up to 5 items related to the proposed work, and another 5 items that are significant but not related to the proposed work.

- 6. **Budget and Subaward Budgets.** Awardees 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. 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 FastLane, NSF's proposal submission system. The total budget shall not exceed \$256,000 for the Phase I proposal. **NOTE: FastLane does not accept symbols or commas in the budget lines.**
  - o **Line A - Senior Personnel.** List the PI 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 month to the proposed project and may be budgeted for more than two months (this deviates from the PAPPG- Chapter II.C.2g(i)(a)). 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 and each of the Senior Personnel.
  - o **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.
  - o **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.
  - o **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.
  - o **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 social distancing and related considerations). The intent of this conference is to discuss the research program with the cognizant

Program Director, learn about preparing a Phase II proposal, and hear from experts on various topics of interest to technical entrepreneurs. A written statement acknowledging attendance 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. Travel for purposes other than the project R&D (e.g. marketing, customer engagements) is not permitted in the Phase I budget, EXCEPT as permitted for participation in the Beat-the-Odds Boot Camp, see discussion below for Line G.6.

- o **Line E.2 - Foreign travel expenses** (Line E.2) are NOT permitted.
- o **Line F - Participant Support Costs.** Participant support costs are NOT permitted on a Phase I grant.
- o **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 should be accompanied by pricing documentation (e.g. quote, link to online price list, prior purchase order or invoice), to be included in the budget justification.
- o **Line G.2 - Publication Costs/Documentation Costs.** Publication Costs/Documentation costs are NOT permitted on a Phase I proposal.
- o **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 Program Director and approved by the Division Director of the Division of Industrial Innovation and Partnerships (IIP). All research on an STTR project, including that conducted by consultants, must be carried out in the U.S. (Place of Performance is defined as: For both Phases I and II, all research must be performed 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 Collaboration.** 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 Budget Justification and NOT as a Supplementary Document.** Multiple letters should be combined as a single PDF before uploading.
  - **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 STTR proposal.
  - **Biographical Sketch.** Provide a biographical sketch for each consultant. Maximum of two pages per person. Provide this in the Budget Justification section, NOT in the Biographical Sketches section.
- o **Line G.4 - Computer Services.** Funds may be allocated for computer services. Requested services with a total cost exceeding \$5,000 should be accompanied by pricing documentation (e.g. quote, link to online price list, prior purchase order or invoice), to be included in the budget justification.
- o **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 (RI) 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 the 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 Program Director and approved by the IIP 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 collaboration that confirms the role of the subaward organization in the project and explicitly states the subaward amount. Provide this letter as part of the Budget Justification and NOT as a Supplementary Document. Multiple letters should be combined as a single PDF before uploading.**
- o **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 should be accompanied by pricing documentation (e.g. quote, link to online price list, prior purchase order or invoice), to be included in the budget justification. In addition to the above, there are two other activities for which NSF permits the inclusion of additional funds on this budget line; see below. The funds noted below may **NOT** be spent for any other commercial or business purpose not explicitly permitted below.

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 Program Director prior to award.

Second, the proposer may budget up to an additional \$20,000 to over costs related to NSF's "Beat-the-Odds Boot Camp" which is offered to all Phase I awardees. This program is based on the NSF's [Innovation Corps](#) (I-Corps) program, and more information can be found [here](#). All Phase I awardees are strongly encouraged to participate in this activity, budgeting \$10,000. The PI and research team of the sub-award to a research institution or university is strongly encouraged to participate and also should separately allocate \$10,000 in direct costs (and therefore the total budget for the Boot Camp would be \$20,000 total). 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 participated 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 budget simply list this as "Boot Camp" costs in the budget justification.

- o **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 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 requiring a 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.*

- o **Line K - Small Business Fee.** Up to seven percent (7%) of the total indirect and direct project costs may be requested as a fee. 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 concern 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 STTR award (i.e., the "Prohibited Expenditures" list does not apply).
  - o **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).
7. **Budget Justification.** The Budget Justification is uploaded in the Budget Module of FastLane 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 no page limit for the Budget and Subaward Budget Justification. You will receive and should disregard a FastLane warning about exceeding the five-page limit when you submit the proposal.** In other words, the PAPPG restriction on page limits is not enforced for this solicitation (but all information included in this section must be related to the budget). Any letters of collaboration from institutions proposed as subawardees in the effort, or individuals proposed as consultants in the effort, should also be included as part of the budget justification document. You can find a sample budget and subaward budget, with justifications, here: <https://seedfund.nsf.gov/fastlane/>.
- o **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.
  - o **Line C - Fringe Benefits.** Describe what is included in fringe benefits and the calculations that were used to arrive at the amount requested.
  - o **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.
  - o **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 should have quotes or pricing documentation included as separate pages in the Budget Justification.
  - o **Line G.3 - Consultant Services.** Include a copy of the signed Letter of Collaboration. Include a biographical sketch for each consultant.
  - o **Line G.5 - Subawards.** Include a few sentences describing the scope and objective of the subaward.
  - o **Line G.6 - Other.** Any single cost of more than \$5,000 should be documented by inclusion of pricing info (e.g. a quote, past purchase order, link to online price list).
  - o **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.
  - o **Line K - Small Business Fee.** Provide the calculation that was used to arrive at the amount requested.
8. **Current and Pending Support of PI and Senior Personnel.** 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. **Effective October 5, 2020, all proposals submitted to NSF are required to include Current and Pending Support for each PI and Senior Personnel using an NSF-approved format.** NSF SBIR and STTR proposers must include this form as part of their proposal submission, however, they may choose to either (1) submit the NSF Current and Pending Support form with all fields completed or (2) submit a partially completed form and provide individual statements (following the format provided in the next paragraph) to be uploaded as Supplemental Documents. Step-by-step guidance can also be found [here](#).
- o **Types of Support / Activities.** For the PI 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.**
  - o **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.
9. **Collaborators & Other Affiliations Information:** 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 help identify potential conflicts or bias in the selection of reviewers. Also see guidance in the [PAPPG](#).
10. **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.
11. **Supplementary Documents.** The supplementary documents permitted in a Phase I proposal are limited to the following (if applicable). The Data Management Plan and Mentoring Plan have their own dedicated modules within the "Supplementary Documents" section of FastLane. All the other items below, if included, should be uploaded in the "Other Supplementary Docs" section as a single PDF file. Please ignore the modules entitled "Project Summary with Special Characters", "GOALI - Industrial PI Confirmation Letter", and "RAISE - Program Officer Concurrence Emails".
- o **S1. 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 SBIR 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.

- o **S2. Mentoring Plan (required if the budget includes subawards requesting funds for postdoctoral scholars).** 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 [here](#).
- o **S3. Cooperative Research Agreement (required).** See the [Cooperative Research Agreement \(CRA\)](#) model. The proposing small business concern must provide a signed written 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 stating that a CRA will be provided upon notification of award recommendation.
- o **S4. Letter(s) of Support (strongly recommended; no more than three letters).** Letters of support act as an indication of market validation for the proposed innovation and add significant credibility to the proposed effort. Letters of support should demonstrate that the company has initiated dialogue with relevant stakeholders (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 and supporting documents from consultants and subcontractors (or any personnel identified in the Budget Justification) are NOT considered letters of support and instead should be included in the Budget Justification section.
- o **S5. Company Commercialization History (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.
- o **S6. Human Subjects Documentation (if applicable).** 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 affirm that the IRB has declared the research exempt from IRB review, 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): <http://www.hhs.gov/ohrp/assurances/index.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 [here](#).

- o **S7. Vertebrate Animals Documentation (if applicable).** 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 Chapter XI.B.3](#) for additional information on the administration of awards that utilize vertebrate animals.
  - o **S8. Resubmission Change Description (if applicable; no more than one page).** A declined proposal may be resubmitted, but only after it has undergone substantial revision. 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. If a Phase I proposing company indicates on the Cover Sheet that the proposal is a resubmission, 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.
12. **Additional Single Copy Documents.** In addition to completing the "Collaborators and Other Affiliations" section, proposers must submit a copy of the email invitation from an NSF 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.

Proposers are also welcome to include suggestions of reviewers to include (or not to include) in the "List of Suggested Reviewers" module. Other than these items, no other information or documents should be included in this section.

Proposers are reminded to identify the NSF publication number (located on the first page of this document) in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

## 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):

February 12, 2021 - March 04, 2021

March 05, 2021 - June 03, 2021

June 04, 2021 - September 02, 2021

September 03, 2021 - January 06, 2022

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 one of the submission windows listed above (up to one year).

## D. FastLane Requirements

---

Proposers are required to prepare and submit all proposals for this program solicitation through use of the NSF FastLane system. Detailed instructions regarding the technical aspects of proposal preparation and submission via FastLane are available at: <http://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail [fastlane@nsf.gov](mailto:fastlane@nsf.gov). The FastLane Help Desk answers general technical questions related to the use of the FastLane 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/](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 *Building the Future: Investing in Discovery and Innovation - NSF Strategic Plan for Fiscal Years (FY) 2018 – 2022*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

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

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

## A. Merit Review Principles and Criteria

---

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

### 1. Merit Review Principles

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

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

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

the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

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

## 2. Merit Review Criteria

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

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

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they 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 underrepresented minorities 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 STTR program has additional criteria that reflect the legislative emphasis of the program and complement the standard NSF review criteria listed above. These criteria are in line with NSF's strong focus on commercialization success as the primary driver of impacts (both economic and otherwise) in the SBIR program.

1. Is there a significant market opportunity that could be addressed by the proposed product, process, or service?
2. 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?
3. Is there a compelling potential business model?
4. Does the proposing company/team have the essential elements, including expertise, structure, and experience, that would suggest the potential for strong commercial outcomes?
5. 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

Proposals submitted to this solicitation which are considered meritorious and which meet all the requirements of the concurrent SBIR solicitation may, based on budgetary considerations and at NSF's discretion, be considered for award as SBIR Phase I projects.

## 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 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 PI 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, PIs 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 PI/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 a Grants Officer in the Division of Grants and Agreements. 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 PI. (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](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](mailto: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](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg).

#### Special Award Conditions:

SBIR/STTR grants are subject to the Small Business Innovation Research/Small Business Technology Transfer Phase I Grant General Conditions (SBIR-I) dated 07/06/2020. These documents may be accessed electronically on NSF's Website at [https://www.nsf.gov/bfa/dias/policy/sbir/sbiri\\_720.pdf](https://www.nsf.gov/bfa/dias/policy/sbir/sbiri_720.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](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 PI 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](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg).

The Phase I final report will be due to NSF **within 15 days following the end date of the grant** 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 FastLane. 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 FastLane.

## 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, Biomedical (BM) Technologies and Medical Devices (MD), telephone: (703) 292-7069, email: [hahn@nsf.gov](mailto:hahn@nsf.gov)
- Peter Atherton, Advanced Analytics (AA); Artificial Intelligence (AI); Cloud and High-Performance Computing (CH); Cybersecurity and Authentication (CA); and Quantum Information Technologies (QT), telephone: (703) 292-8772, email: [patherto@nsf.gov](mailto:patherto@nsf.gov)
- Anna Brady-Estevez, Chemical Technologies (CT); Energy Technologies (EN); and Distributed Ledger (DL), telephone: (703) 292-7077, email: [abrady@nsf.gov](mailto:abrady@nsf.gov)
- Kaitlin Bratlie, Pharmaceutical Technologies (PT), telephone: (703) 292-2638, email: [kbratlie@nsf.gov](mailto:kbratlie@nsf.gov)
- Diane Hickey, Augmented and Virtual Reality (AV); Learning and Cognition Technologies (LC); and Human-Computer Interaction (HC), telephone: (703) 292-8875, email: [dhickey@nsf.gov](mailto:dhickey@nsf.gov)
- Steven Konsek, Advanced Materials (AM); Power Management (PM); Nanotechnology (N); Semiconductors (S); Photonics (PH); and Other Topics (OT), telephone: (703) 292-7021, email: [skonsek@nsf.gov](mailto:skonsek@nsf.gov)
- Rajesh Mehta, Environmental Technologies (ET), telephone: (703) 292-2174, email: [rmehta@nsf.gov](mailto:rmehta@nsf.gov)
- Elizabeth Mirowski, Advanced Manufacturing (M) and Mobility (MO), telephone: (703) 292-2936, email: [emirowsk@nsf.gov](mailto:emirowsk@nsf.gov)
- Alastair Monk, Digital Health (DH), telephone: (703) 292-4392, email: [amonk@nsf.gov](mailto:amonk@nsf.gov)
- Muralidharan S. Nair, Internet of Things (I); Robotics (R); Space Technologies (SP); and Wireless Technologies (W), telephone: (703) 292-7059, email: [mnair@nsf.gov](mailto:mnair@nsf.gov)
- Erik Pierstorff, Biological Technologies (BT), telephone: (703) 292-2165, email: [epiersto@nsf.gov](mailto:epiersto@nsf.gov)
- Benaiah D. Schrag, Instrumentation and Hardware Systems (IH), telephone: (703) 292-8323, email: [bschrag@nsf.gov](mailto:bschrag@nsf.gov)

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

- FastLane and Research.gov Help Desk: 1-800-673-6188
- FastLane Help Desk e-mail: [fastlane@nsf.gov](mailto:fastlane@nsf.gov)
- Research.gov Help Desk e-mail: [rgov@nsf.gov](mailto:rgov@nsf.gov).

## IX. OTHER INFORMATION

---

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

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

## ABOUT THE NATIONAL SCIENCE FOUNDATION

---

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

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

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

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

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

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

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at <https://www.nsf.gov>

- **Location:** 2415 Eisenhower Avenue, Alexandria, VA 22314
- **For General Information** (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](mailto:nsfpubs@nsf.gov)
  - or telephone: (703) 292-8134
- **To Locate NSF Employees:** (703) 292-5111

## PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

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

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

[Policies and Important Links](#) | [Privacy](#) | [FOIA](#) | [Help](#) | [Contact NSF](#) | [Contact Web Master](#) | [SiteMap](#)



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

[Text Only](#)