

NSF 24-584: Advanced Technological Education (ATE)

Program Solicitation

Document Information

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National Science Foundation
Directorate for STEM Education
Division of Undergraduate Education

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

October 03, 2024

First Thursday in October, Annually Thereafter



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Important Information And Revision Notes

Track 1: Small Scale Projects: Maximum budget of \$475,000 over three years and is no longer restricted to institutions who haven't received an ATE award in the past seven years. Institutions new to ATE are still encouraged to submit to this track, and indicate in the project description that the institution is new to ATE.

Track 2: ATE Projects: Maximum budget of \$1,000,000 over three years.

Track 4: Center Planning proposals: No longer supported.

Track 4: ATE Resource/Support Centers: No longer supported. For sunsetting Centers a proposal to support established high-value activities that are not otherwise sustainable may be appropriate under Track 2: ATE Projects.

Track 5: Removed. Applied Research on Technician Education projects are supported under Track 2: ATE Projects.

Prospective PIs are strongly encouraged to use an open licensing approach for any new learning materials and computer software source code when these materials are developed as a component of the proposed project.

Active Dear Colleague Letters associated with the ATE Program:

Please check that the DCL is still active and contact an ATE Program Officer prior to submission of either a proposal or supplemental funding request.

- DCL 20-054, ATE-Undergraduate Research Experiences: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf20054
- DCL 22-059, Ocean Technical Workforce Education: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf22059
- DCL 22-120, Enhancing Engineering Technology and Advanced Semiconductor Manufacturing Technician Education (ETSTE): https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf22120
- DCL 23-093, A New Supplemental Funding Opportunity for Skills Training in Advanced Research & Technology (START): https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf23093
- DCL 24-094, S-STEM Scholarship Supplements for Advanced Technological Education (ATE) Awardees: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf24094
- DCL 24-014, Aligning Fundamental Research and Education in Advanced Manufacturing with the Objectives of the Manufacturing USA Institutes: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf24014

Any proposal submitted in response to this solicitation should be submitted in accordance with the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) that is in effect for the relevant due date to which the proposal is being submitted. The NSF PAPPG is regularly revised and it is the responsibility of the proposer to ensure that the proposal meets the

requirements specified in this solicitation and the applicable version of the PAPPG. Submitting a proposal prior to a specified deadline does not negate this requirement.

Summary Of Program Requirements

General Information

Program Title:

Advanced Technological Education (ATE)

Synopsis of Program:

With a focus on two-year Institutions of Higher Education (IHEs), the Advanced Technological Education (ATE) program supports the education of technicians for the high-technology fields that drive our nation's economy. The program involves partnerships between academic institutions (grades 7-12, IHEs), industry, and economic development agencies to promote improvement in the education of science and engineering technicians. It is strongly recommended that projects be faculty-led and required that courses and programs are credit-bearing, although materials developed may also be used for incumbent worker education. Materials may also be adapted and implemented as credit-bearing courses. The ATE program supports curriculum development; professional development of college faculty and secondary school teachers; career pathway development for both students and incumbent workers; and other activities including applied research projects that advance the knowledge base related to technician education.

The ATE program encourages partnerships with other entities that may impact technician education. For example, with

- the National Institute of Standards and Technology (NIST) Manufacturing Extension Partnerships (MEPs) (<https://www.nist.gov/mep>) as applicable to support technician education programs and the industries they serve; and
- Manufacturing USA Institutes (<https://manufacturing.gov/>) addressing workforce development issues.

The ATE program encourages proposals from [Minority Serving Institutions](#) as well as other institutions that support the recruitment, retention, and completion (certificate, degree, program) of the full spectrum of diverse talent that society has to offer, which includes underrepresented and underserved communities, in STEM technician education programs that award associate degrees.

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.

- V. Celeste Carter, Lead Program Director, telephone: (703) 292-4651, email: vcarter@nsf.gov
- Paul Tymann, Co-lead Program Director, telephone: (703) 292-2832, email: ptymann@nsf.gov

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

- 47.076 --- STEM Education

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 45 to 80

NSF anticipates that approximately \$74.0 million will be available for new and continuing awards in this program in FY2025. In FY 2025, the ATE program expects to fund new awards totaling \$69,000,000 million.

Funding in all years is subject to the availability of funds. The program expects to make 45-80 new awards per year. Grants may be awarded in a wide variety of sizes and durations, as summarized below. The categories below are expected to encompass most of the activities supported through the ATE program; however, additional activities may be proposed after consultation with an ATE program officer under the heading of a special project. These activities would inform the education of the skilled technical workforce (STW). The actual number of awards and the award sizes are subject to the availability of funds and the quality of proposals received.

Anticipated Funding Amount: \$74,000,000

It is anticipated that this funding amount will be available for new and continuing awards in this program in FY2025. Funding in all years is subject to the availability of funds.

Eligibility Information

Who May Submit Proposals:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- Non-profit, non-academic organizations: Independent museums, observatories, research laboratories, professional societies and similar organizations located in the U.S. that are directly associated with educational or research activities.
- For-profit organizations: U.S.-based commercial organizations, including small businesses, with strong capabilities in scientific or engineering research or education and a passion for innovation.
- State and Local Governments
- Tribal Nations: An American Indian or Alaska Native tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges as a federally recognized tribe pursuant to the Federally Recognized Indian Tribe List Act of 1994, 25 U.S.C. §§ 5130-5131.

Who May Serve as PI:

The ATE program focuses on IHEs that award two-year degrees in advanced technology fields and requires these IHEs and their faculty to have significant leadership roles on all projects. When a four-year IHE or other types of organizations submit as the fiscal lead, then two-year IHE faculty must be identified as Co-PIs. When a secondary institution or school district develops a proposal, community college faculty must be identified as Co-PIs.

Consortium (Track-3) PIs must not hold a leadership role in an active ATE Center.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

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

There are no restrictions or limits.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposals:** Not applicable.
- **Full Proposals:**
 - Full Proposals submitted via Research.gov: *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) guidelines apply. The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.
 - Full Proposals submitted via Grants.gov: *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov* guidelines apply (Note: The *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide).

B. Budgetary Information

- **Cost Sharing Requirements:**

Inclusion of voluntary committed cost sharing is prohibited.
- **Indirect Cost (F&A) Limitations:**

Not Applicable
- **Other Budgetary Limitations:**

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

C. Due Dates

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

October 03, 2024

First Thursday in October, Annually Thereafter

Proposal Review Information Criteria

Merit Review Criteria:

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

Award Administration Information

Award Conditions:

Standard NSF award conditions apply.

Reporting Requirements:

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

I. Introduction

The Advanced Technological Education (ATE) program supports the education of the skilled technical workforce at the undergraduate and secondary school levels. The skilled technical workforce has been defined as individuals who use a high level of science and engineering skills in their jobs but do not hold a baccalaureate degree. Proposals to the program

may aim to affect specialized technology courses or core science, mathematics, and technology courses that serve as immediate prerequisites or co-requisites for specialized technician education courses/programs. The curricular focus and the activities of all projects should demonstrably contribute to the ATE program's central goals: producing more qualified science and engineering technicians to meet workforce demands, and improving the technical skills and the general science, technology, engineering, and mathematics (STEM) preparation of these technicians and the educators who prepare them. It is required that courses developed or updated be credit-bearing courses with the potential to contribute to or result in an academic credential. Institutions may also make use of their non-credit bearing offerings if they can demonstrate increased opportunities to engage incumbent workers and convert these offerings to academic credit.

The ATE program focuses on IHEs that award two-year degrees in advanced technology fields and requires these IHEs and their faculty to have significant leadership roles on all projects. It is recommended that two-year IHEs serve as the fiscal lead on proposals with four-year IHEs being sub-awardees. When a four-year IHE submits as the fiscal lead, then two-year IHE faculty must be PI or Co-PIs. Effective technological education programs should involve partnerships in which two-year IHEs work with four-year IHEs, secondary schools, business, industry, economic development agencies, and government. The partnerships and collaborations should respond to employers' hiring needs for highly skilled technicians with the ability to learn and embrace change. Projects that focus on secondary school teachers and students must demonstrate a clear pathway to a two-year technician education program. When a secondary institution or school district develops a proposal, community college faculty must be PI or Co-PIs, and the results are expected to impact both the secondary career and technical education (CTE) program and the two-year technician education program.

Fields of technology supported by the ATE program include, but are not limited to, advanced manufacturing technologies, agricultural and bio- technologies, energy and environmental technologies, engineering technologies, information technologies, micro- and nano-technologies, security technologies, geospatial technologies, autonomous technologies, as well as applied research on technician education that informs all supported areas. It is expected that emerging areas such as artificial intelligence (AI) and quantum information sciences will be supported as industry defines their needs for skilled technical workers in these areas. The ATE program is interested in projects addressing issues in: 1) rural technician education; 2) projects that broaden the participation of the full spectrum of diverse talent that society has to offer in the entry-level technical workforce including strategies to recruit veterans into technician education programs; 3) projects that focus on recruiting, retaining and completing students with disabilities into STEM technician education programs; and 4) projects that support emerging industry needs for skilled technical workers, for example, industry needs for technicians with AI knowledge and skills. The ATE program does not support projects that focus on students who will become health, veterinary, or medical technicians.

Projects must have an institutional impact, make a case that graduates with these skills will have a measurable impact on the local workforce, and have the potential to impact technician education regionally and/or nationally. All projects must be guided by a coherent vision of technological education--a vision that recognizes technicians as life-long learners who can respond to the needs of the modern workplace and possess employability skills such as critical thinking and problem-solving skills. The articulation of educational programs across different levels (e.g. secondary to two-year to four-year degree programs) can help learners continue to update skills over time in response to the demands of the workplace. All ATE proposals are expected to communicate a realistic vision and an achievable plan for sustainability. Being sustainable means that a project, consortia, or center has developed a product or service that the host institution, its partners, and its target audiences want to see continued and will dedicate effort and resources to support sustainability.

To be sustainable is to ensure products and services have a life beyond ATE funding. Evidence of potential sustainability includes, for example:

- The institution commits to maintaining positions for faculty/personnel hired by the project;
- The institution or partners agree to supply resources to support parts of the project after the NSF award ends, and/or seeks other sources of funding;
- The institution commits to continuing to maintain, improve and disseminate resources developed by the project.

The almost 2,300 ATE projects and centers supported to date provide a base upon which future ATE projects should build. Information about these projects can be found on the NSF web site using the ATE program element code of 7412 in the

awards search function (<https://www.nsf.gov>). ATE Central (<https://atecentral.net>) directs users to a full range of high-impact ATE resources available online, including curricula, learning objects, podcasts, and the ATE Impacts Book, as well as providing a variety of information about funded ATE projects and centers. The South Carolina Advanced Technological Education (SCATE) Center is the fiscal lead on the Mentor Connect project and hosts an informative website (<https://mentor-connect.org>). The Advanced Technological Education TV project (ATETV) is another resource on technician education (<https://www.atetv.org>). The EvaluATE Resource Hub at Western Michigan University partners with ATE projects, consortia, and centers to expand their use of exemplary evaluation practices, strengthen the knowledge base of the ATE program about evaluation and support the continuous improvement of technician education throughout the nation (<https://www.evaluate.org>). Annual survey results may also be found at the EvaluATE site. The ATE program has also supported several studies by the National Academies of Sciences, Engineering and Medicine, and these may be found on the Academies website (<https://nap.nationalacademies.org>). The studies include "Community Colleges in the Evolving STEM Education Landscape", "Engineering Technology Education in the United States", and "Building America's Skilled Technical Workforce".

II. Program Description

A. PROGRAM TRACKS

The ATE program supports proposals in four major tracks:

- Track 1: Small Scale Projects
- Track 2: Projects
- Track 3: Consortia for Innovations in Technician Education
- Track 4: Centers

Proposals in all tracks should demonstrate a thorough awareness of previous relevant ATE grants, research on effective technician education, and contemporary developments in the relevant field(s) of technology. Whenever feasible, projects should utilize and innovatively build upon successful educational materials, courses, curricula, strategies, and methods that have been developed through other ATE grants, as well as other exemplary resources (including those not supported by NSF) that can be adapted to technological education. Proposers should contact the Principal Investigators (PIs) of previously funded projects and centers to explore the possibilities for adapting materials, evaluating materials, receiving guidance, or collaborating in other ways, such as conducting research projects that focus on the effectiveness of technician education.

Prospective PIs are encouraged to do a thorough literature search for funded projects related to their ideas. If such projects can inform the PI, he/she is encouraged to adapt and implement materials and/or strategies rather than re-developing materials. A successful proposal will provide evidence that innovative materials and practices have been effective at other named institutions, provide realistic implementation plans, and explain why the materials and practices are anticipated to be effective for the students in a new setting. The project scope may range from improvements in an individual course or laboratory to a more comprehensive effort that impacts entire curricula or programs.

All proposals may request instrumentation for student use in gaining skills and competencies (see Other Budgetary Limitations section).

For all Tracks, proposals may focus on one or more of the areas described below. Multifaceted projects that cut across areas are encouraged.

All projects are expected to stimulate innovation in technician education as well as contribute to expanding the base of two-year IHEs participating in the program. The ATE program is particularly interested in projects addressing issues in rural technician education.

Program Development and Improvement: These projects should align technician education with modern practices and assure an increased number of students with an enhanced STEM theoretical understanding and technical skills and competencies enter the high-performance workplace.

Proposed activities should produce a coherent sequence of classes, laboratories, and work-based educational experiences to produce a compelling learning environment for students preparing to be science and engineering technicians. Employers must be committed partners with defined project roles and responsibilities as detailed in letters of commitment, and the resulting program should constitute a model that could be disseminated broadly. The program should lead students to an appropriate associate degree, specific occupational competency or certification; provide business, industry and public sector agencies with a larger pool of skilled technicians; and support student recruitment, retention, and completion of programs. The PI should articulate clear project goals and objectives, and evaluative activities should be tied to the goals, objectives, and activities. It is expected that data on student completion and initial job placement will be gathered and reported on. Programs for the development of baccalaureate degree programs or that focus solely on pathways to baccalaureate degrees are not eligible.

A program development and improvement proposal might include:

- Developing new resources or courses that add rigorous STEM content and industry-relevant skills to technician education programs;
- Developing innovative methods for using laboratory-, field- and work-based experiences to improve students' understanding of basic principles and the high-performance workplace;
- Utilizing modern instrumentation and new technologies to address the knowledge, skills, and competencies needed for the evolving, converging, and emerging workplace;
- Integrating industry standards and workplace competencies into the curriculum including employability skills (<https://cte.ed.gov/initiatives/employability-skills-framework>), critical thinking, and problem-solving skills;
- Implementing strategies to support student recruitment, retention, and program completion;
- Developing life-long career and educational pathways for technicians to support the changing workplace, including developing or improving articulation between programs at secondary schools and two-year IHEs, or between two-year to four-year IHEs degree programs;
- Providing industry internships, apprenticeships, and/or undergraduate research experiences including course-based undergraduate research experiences (CUREs) that build both technical skills and competencies and employability skills; and
- Acquiring instrumentation and developing curricular modifications to support existing programs that have been determined, in partnership with industry, to be critical for enhancing workforce readiness. Industry partner(s) must provide a letter describing how the changing workplace needs require the new instrumentation and their role in curricular revisions.

Curriculum and Educational Materials Development: A project may focus on curriculum and materials development with the intent of broadly disseminating the developed products. Proposed project activities should affect the learning environment, course content, and experience of instruction for students preparing to be science and engineering technicians and for their faculty. Projects may develop new print, electronic, and multimedia resources, including simulations, scenarios, and web-based collections as well as laboratory experiments and manuals. It is expected that products will be developed with input from business, industry, and government, validated by experts from these organizations, field tested in diverse locations, and validated in terms of their effectiveness in meeting learning goals. A project may also be designed to adapt non-credit bearing courses/modules/ to credit-bearing courses/modules (e.g. stackable credentials in a credit-bearing program).

Professional Development for Educators: ATE supports projects that provide current secondary school teachers and IHE faculty with opportunities for continued professional growth in areas that directly impact technician education. These projects should be designed to enhance the educators' disciplinary capabilities, teaching skills, understanding of current technologies, practices, and employability skills. Activities typically include workshops/meetings, intensive seminars, industry internships, or a combination of these. Such activities typically last from a few days to several weeks and are usually conducted in the summer, with follow-on activities conducted during the academic year. To effect long-term change, workshop/meeting participants should demonstrate institutional support. The program particularly encourages activities that involve secondary school teachers and two-year IHE faculty working together.

Additionally, the program encourages activities that provide pedagogical skills to industry scientists and skilled tradespeople who wish to teach. Project personnel should communicate desired learning outcomes to the project evaluator, and evaluation activities should demonstrate attainment of learning outcomes as well as use in the classrooms and sustainable changes in the practice of participating faculty and teachers. Changes in student learning outcomes as well as students' perceptions of technical careers should be assessed, and the data shared in annual and final reports. As with all ATE projects, two-year faculty are required to be in leadership roles, and it is expected that all professional development activities include business and industry partners to assure that the faculty and teacher training is relevant and aligned with workforce needs.

Leadership Capacity Building for Faculty: The vitality and growth of the ATE community is closely linked to industry trends and needs as well as the acumen of the PIs and their institutions. As such, faculty must: 1) work with their institutional administration; 2) effectively manage both programs and project/center activities; 3) maintain industry connections that include local, statewide, and national economic development efforts; and 4) maintain and cultivate networks with other recipients across funding agencies. Activities that foster these skills might include:

- Mentoring programs that link experienced ATE PIs with new recipients. Activities are expected to lead to new PIs acquiring the skills needed to successfully manage, complete, evaluate, disseminate and sustain their projects as well as fostering leadership skills such that they may become mentors at a future time;
- Identifying and mentoring faculty and their administrators for the purpose of developing and implementing a new curriculum in an advanced technological area to educate technicians for local industry needs; and
- Developing and implementing outreach activities that impact faculty and their institutions educating them about the value and potential impact of working with the ATE Program and its community. These efforts could include providing information on funding opportunities, developing effective proposal writing skills, providing guidance on ways of surveying area industry to determine industry needs as well as finding and working with local workforce investment boards and other entities.

Teacher Preparation: The foundation for advanced technological education is grounded in strong STEM education in K-12 schools. The preparation of future STEM and career and technical education (CTE) teachers who will facilitate student learning in mathematics and science and cultivate an interest in technological careers is an important component of educating the skilled technical workforce. ATE teacher preparation projects help prepare a future teaching workforce that is skilled in teaching science and mathematics, understands the technological workplace, and can prepare students to use a variety of approaches to solve real-world technology-related problems using design processes and principles (See Standards for Technological Literacy, International Technology and Engineering Educators Association).

Teacher Preparation projects must involve both two-year and four-year institutions unless the two-year institution offers a four-year baccalaureate program in teacher preparation. Other partners include industry and relevant associations to inform the program about the changing technological workplace. Projects should aim to increase the number, quality, and participation of the full spectrum of diverse talent that society has to offer, of prospective STEM and/or CTE teachers in pre-service or paraprofessional programs. These projects are expected to improve prospective teachers' technological understanding, provide them with experiences to use in engaging students in real world technological problems, improve their understanding of the modern workplace, and strengthen their preparation in science and mathematics. These projects are expected to build on the extensive research literature on teacher preparation. Two-year IHEs have the unique advantage of having technology faculty connected with the high-performance workplace who can work with mathematics and science faculty in developing and serving as faculty for these programs.

Entrepreneurial Skills Development for Students: In addition to technical skills and disciplinary content, students entering the advanced technological industries environment need skills that allow them to work effectively in industry. Many companies have a global presence, and students need to understand that the global economy affects them as employees. Another sector of industry is composed of small start-up companies, and these have different attributes than large established firms. Students need to understand the attributes of their employers to be effective employees.

Employers often expect employees to possess knowledge, skills and competencies in a specific technical area and to demonstrate professional, industry- related and entrepreneurship acumen. Entrepreneurship skills can be developed in

students enrolled in technician education programs by engaging students in problem-based learning using projects of interest to local industry, working with local economic investment organizations, and developing incubator programs that provide students with experiences interacting with entrepreneurs. Projects are encouraged that:

- Prepare traditional students and returning learners to develop and apply technical, professional, industry-related, and entrepreneurship knowledge, skills, and competencies within the context of a technician education program;
- Incorporate global issues and international technological practices into technician education programs; and
- Introduce students to business plans, marketing strategies, networking and interviewing skills, and characteristics of successful entrepreneurs within the context of the technician education program.

Applied Research on Technician Education

Proposals are expected to investigate issues related to the education and preparation of skilled technical workers.

Proposals are particularly encouraged that address industry certifications or credentialing; issues such as recruitment, retention and attainment of degrees and credentials; and emerging careers and pathways. Proposals must include meaningful partnerships among faculty at two-year and four-year IHEs, and industry when appropriate. All projects must demonstrate their alignment with the goals of the ATE program and contribute to the knowledge base on technician education.

Investigators who are interested in conducting an applied research project are strongly encouraged to discuss their plans with an ATE program officer prior to submission.

Track 1: Small Scale Projects

This track supports projects that are smaller in scale and may be of shorter duration than Track 2 Projects. It is recommended that institutions and/or PIs with limited prior experience in the ATE program use this track as an entry point into the program. Projects in this category may also serve as prototypes or pilots for an idea that may be expanded in a future ATE proposal.

Track 2. ATE PROJECTS

This track supports a diversity of project areas focused on improving the education of the skilled technical workforce, and these projects are usually larger in scope than those proposed under Track 1.

Track 3: Consortia for Innovations in Technician Education

This track supports collaborations to strengthen partnerships between two-year IHEs and industry to be responsive to industry needs and regional economic development. A consortium must address either a specific industry area or address a challenge where the convergence of technologies is changing the skills and competencies needed by the skilled technical worker. PIs are expected to collaborate with relevant ATE Center(s), ATE Resource Centers, and projects focused on the same technological area(s). Consortium PIs must not hold a leadership role in an active ATE Center. The proposal must include a section that identifies specific activities that require collaboration with Center(s) and projects and how the consortium intends to leverage and build upon existing resources and networks. In the project description this section should be labeled: Consortia Connections to ATE Center(s) and Projects. Consortia projects must be led by a two-year IHE and require the expertise of one or two other two-year IHEs. Proposals are expected to detail the unique contributions of each partner to the consortium.

Some examples of possible Consortia focal points include:

- Several two-year IHEs with programs supporting the automotive industry as it shifts to alternative fuels and electric vehicles might form consortia to respond to changing industry needs for technicians;
- The integration of cybersecurity into advanced manufacturing (or any other advanced technological industry) might bring together two-year IHEs that separately support programs in cybersecurity and advanced manufacturing to develop appropriate materials across the converging areas;

- Renewable energy programs might form consortia with building technologies programs and environmental programs; and
- The integration of artificial intelligence (AI) into advanced manufacturing programs (or any other advanced technological industry) might bring together two-year IHEs that separately support programs in AI and advanced manufacturing to develop appropriate materials across these converging areas.

Track 4: ATE CENTERS

The ATE program recognizes the need to develop an integrated approach to technician education that will define and disseminate the critical knowledge and skills required to support the advanced technology industries in the US. To facilitate this integrated approach, the ATE program will support a center in each of the following areas: Advanced Manufacturing Technologies, Agricultural Technologies, Autonomous Technologies, Biotechnology, Energy Technologies, Environmental Technologies, Engineering Technologies, Information Technologies, Security Technologies, and Micro- and Nano-Technologies. Proposals may be considered for an emerging advanced technology field that is not included in the previous list, if that field has a high potential for career opportunities for two-year IHE graduates (e.g., AI, Quantum Information Sciences).

Strategies for Developing an ATE Center Proposal

Center Proposal: Two-year IHEs contemplating a proposal for a Center are strongly encouraged to make early contact with one of the ATE Lead Program Directors to discuss their ideas.

ATE Centers will be led by experienced leaders in the proposed field or technology. This may include a record of teaching and faculty professional development in the disciplinary area and/or prior work in the industry. Center PIs are expected to demonstrate prior successful completion of ATE projects. Center proposals must build upon prior efforts of both project personnel and others in the field.

Current active centers are encouraged to work together with a new prospective PI and institution to prepare a proposal for a given technical field.

Expected Outcomes of ATE Centers

To advance the ATE program's mission of educating the skilled technical workforce, ATE Centers will:

- Support systemic reform, broad outreach, community-building, and leadership development among educational institutions, industry, professional and trade associations, educators, and incumbent technicians;
- Establish an effective dialogue and collaborations between existing and new ATE projects in the same or related technological fields across the nation;
- Provide models and leadership for collaborations in which two-year IHEs work with four-year IHEs, secondary schools, business, industry, economic development agencies, and government;
- Mentor prospective PIs to broaden the impact of ATE;
- Promote technician careers and visibility and the public image in the field(s) on which the Center is focused;
- Address technician knowledge, skills, and competencies needed for the evolving, converging, and emerging technical workplace;
- Provide faculty professional development opportunities within their area of expertise; and
- Develop a realistic plan for achieving sustainability and institutionalization of successful center functions following the period of NSF funding.

After an initial five years, an ATE Center that continues to meet the ATE program requirements may request support for an additional five year period. Renewal proposals must document clear results and impacts of prior support. Additionally, new goals and activities informed by the results of the evaluation of the prior project should be detailed along with a plan for sustainability. Renewal proposals will compete with other center proposals in the same technological area.

Proposals for Centers must clearly articulate a national vision of technological education in the specific field and describe a workable plan for achieving that vision during the period of NSF funding. Proposals must describe the expected impacts of the proposed ATE Center on industry, technician education programs at the national, regional, and local levels, and institutions. The evaluation plan for a Center should describe strategies for measuring impacts on institutions, faculty, students, and industry, and the Center's success in coordinating with ATE projects and other stakeholders.

Information about the internal and external resources that will be made available to the project should be described in the Facilities, Equipment, and Other Resources section of the proposal. It is expected that, during the first five-year award, an ATE Center will seek a variety of additional funding sources to support sustainability. The success of these sustainability efforts, as well as the description of a sustainability plan, will be critically reviewed for renewal of funding.

Proposals for ATE Centers must include a letter from the president or chief academic officer of the host institution documenting the institution's commitment to the center.

Logistical Information

The "Center" proposal type should be selected in Research.gov or Grants.gov.

Deadlines

The staggered dates for specific areas of technology (below) reflect the submission dates for ATE Center proposals.

Proposal Deadline	Area of Technology (for ATE Center Proposals)
(follow published solicitation deadline dates)	
October 2024 (for funding in 2025)	Engineering Technologies Micro- and Nanotechnologies Agricultural Technologies
October 2025 (for funding in 2026)	Advanced Manufacturing Environmental Technologies Security Technologies
October 2026 (for funding in 2027)	Energy Technologies
October 2027 (for funding in 2028)	Information Technologies
October 2028 (for funding in 2029)	Biotechnology Emerging Advanced Technological Area

ATE Center proposals submitted outside the specified deadlines and topical areas above will be returned without review.


If an ATE Center is not funded in a specified area of technology during the year in which proposals are accepted, proposals in that area will again be accepted in the subsequent years until one is funded. Proposals for an ATE Center for a "new emerging area of technology" will be evaluated by NSF staff and external reviewers for appropriateness as a new topical area for an ATE Center. Prospective investigators with an idea for an emerging area are required to contact an ATE Program Officer before submitting a proposal.

Conferences and Meetings: In addition to the tracks described above, the ATE program supports a small number of conferences, meetings, and special projects that lead to a better understanding of issues in advanced technological education. These efforts must be related to the mission of the ATE program. Discussion with a program officer is strongly

encouraged prior to submitting a proposal, and these proposals may be submitted outside of the regular submission dates for the program, but the proposers should plan on at least a 10-month lead time to allow for review and processing of the proposal.

Budgets for conferences and meetings are expected to be consistent with the duration of the event, and the number of participants, but the cost will normally not exceed a total of \$250,000. It is expected that conferences and meetings will be outcome-based, and the final report will contain a statement of the impacts of the event. Proceedings of the conference are expected to be published and widely disseminated. The "Conference" proposal type should be selected in Research.gov or Grants.gov. Additional information about the preparation of conference proposals is available in Chapter II of the PAPPG.

B. INFORMATION ABOUT PREVIOUS AWARDS

- NSF's web site (<https://www.nsf.gov>) provides an Awards Search feature that allows customized searches of NSF's award database. Proposers are also encouraged to search <https://atecentral.net>  and contact PIs of previous awards.

III. Award Information

Anticipated number, size, and duration of new awards:

Track 1: Small scale projects: approximately 12-20 awards for up to \$475,000 each, typically spread over three years. It is expected that the budget request will match the scope of the project.

Track 2: Projects: Approximately 30-45 new awards for up to \$1,000,000 each, and having a duration of up to three years. It is expected that the budget request will match the scope of the project.

Track 3: Consortia for Innovations in Technician Education: Approximately 1-5 new awards, ranging from \$1,200,000 to \$3,000,000 typically spread over 3-4 years. Consortia of two, two-year IHEs have a maximum budget of \$1,200,000. Consortia of three or more two-year IHEs have a maximum budget of \$3,000,000. It is expected that the budget request will match the scope of the project.

Track 4: ATE Center: Funding will be \$7,500,000 spread over five years, with the possibility of a competitive renewal for \$7,500,000 over an additional five years. It is expected that 1-3 awards may be made each year.

Funding in all years is subject to the availability of funds.

After an initial five years, an ATE Center that continues to meet the ATE program requirements may request support for an additional five year period. Renewal proposals must document clear results and impacts of prior support. Additionally, new goals and activities informed by the results of the evaluation of the prior project should be detailed along with a plan for sustainability. Renewal proposals will compete with other center proposals in the same technological area.

IV. Eligibility Information

Who May Submit Proposals:

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

associated with educational or research activities.

- For-profit organizations: U.S.-based commercial organizations, including small businesses, with strong capabilities in scientific or engineering research or education and a passion for innovation.
- State and Local Governments
- Tribal Nations: An American Indian or Alaska Native tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges as a federally recognized tribe pursuant to the Federally Recognized Indian Tribe List Act of 1994, 25 U.S.C. §§ 5130-5131.

Who May Serve as PI:

The ATE program focuses on IHEs that award two-year degrees in advanced technology fields and requires these IHEs and their faculty to have significant leadership roles on all projects. When a four-year IHE or other types of organizations submit as the fiscal lead, then two-year IHE faculty must be identified as Co-PIs. When a secondary institution or school district develops a proposal, community college faculty must be identified as Co-PIs.

Consortium (Track-3) PIs must not hold a leadership role in an active ATE Center.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

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

There are no restrictions or limits.

Additional Eligibility Info:

Consortia (Track 3) projects must be led by a two-year IHE and one or two other two-year IHEs must participate as subawardees.

V. Proposal Preparation And Submission Instructions

A. Proposal Preparation Instructions

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

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

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

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

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

The following instructions for particular sections of the proposal supplement or deviate from the guidance found in the PAPPG and the NSF Grants.gov Application Guide. Refer also to Section II, Program Description, for additional proposal preparation information and instructions for the different program tracks.

For Track 4: Centers proposals, the "Center" proposal type should be selected in Research.gov or Grants.gov. All other Tracks should select the "Research" type of proposal.

Project Data Form: The information on this form is used to direct the proposal to appropriate reviewers and to determine the characteristics of NSF-supported projects. Take special care to identify the proper track for your proposal in Item 1 on the form. For any audience code(s) marked in Item F, include in the Project Description a substantive discussion of the specific strategies that the project will employ to affect the audience(s). Note: In Research.gov, the Project Data Form will show up in the list of required Proposal Sections for your proposal only after you have selected the correct Funding Opportunity Number in Step 1 of the Proposal Creation Wizard. Grants.gov users should refer to Section VI.5. of the NSF Grants.gov Application Guide for specific instructions on how to submit the DUE Project Data Form.



Project Summary: The Project Summary should clearly indicate, in the overview section, the disciplinary focus (or foci) of the proposed project, the kinds of activities to be undertaken (e.g., educational materials development, adaptation and implementation, professional development for educators), and the primary audience to be affected by those activities (e.g., two-year IHE students, secondary school students, two-year IHE faculty members, secondary school teachers).

Project Description: The length of the Project Description is limited to 15 pages. The Project Description must begin with the subsection on Results from Prior NSF Support, and this subsection should cover NSF awards pertaining to the new proposal. Awards from other sources that directly impact the proposed work should also be included. This subsection must contain specific outcomes and results including metrics to demonstrate the impact of the project activities.

Center renewals may submit up to five pages of Results from Prior NSF Support in the Supplementary Documents. The first section of the Project Description should provide a few overview sentences about past results and outcomes and direct the reader to the supplementary documents for the complete Results from Prior NSF Support.

Consortium (Track-3) proposals must include a section labeled "Consortia Connections to ATE Center(s) and Projects" that identifies specific activities that require collaboration with Center(s) and projects and how the consortium intends to leverage and build upon existing resources and networks.

For all projects, the Project Description must explain the project's motivating rationale, goals, objectives, deliverables, and activities; the timetable; the management plan; the roles and responsibilities of the PI, co-PI(s), and other senior/key personnel; the plan for sustainability after the period of NSF funding; the evaluation plan; and the dissemination plan. Submission of the evaluation plan in supplementary documents is not allowable and may result in the proposal being returned without review. For information about effective approaches to evaluation, see the following resources:

- The EvaluATE Center (<https://evalu-ate.org> )
- Evaluation tools for Undergraduate Research (EvaluateUR), Course-based Undergraduate Research (EvaluateCURE), and STEM competitions (EvaluateCompete): <https://serc.carleton.edu/evaluateur/index.html> 

Evaluation: All ATE-funded work must be evaluated. Project descriptions must include a subsection titled "Evaluation Plan" that includes the following information:

- The primary role of the evaluator is to analyze collected data to summarize findings and inform project team decision making about any modifications to the implementation of the project activities (i.e., formative evaluation). At the end of the project, the project evaluator should provide a summative evaluation identifying key accomplishments, their impacts, and lessons learned.
- Clear alignment between the evaluation plan and the project's goals, objectives, and intended outcomes, activities, and deliverables must be detailed.
- Surveys should be developed in partnership (project team members and the evaluator). Project staff may administer surveys.
- Routine metrics may be collected by a member of the project team and the budget may request funds to support these activities.
- The specific data sources, data collection instruments, and methods should be identified.
- A timeline for the evaluative activities must be included that identifies when data will be collected, when reports will be submitted, and the frequency of communication between the external evaluator and project personnel.
- The inclusion of a logic model is optional, and proposals will not be negatively impacted if not included.
- If evaluation is being performed by a team, the project management plan should clearly describe the expertise and role/responsibility of each member; the budget should reflect this distribution of effort.

If the evaluator or evaluation team is named in the proposal, then their Biographical Sketch(es) must be uploaded in the section in Research.gov called "Other Personnel Biographical Information", and they must follow the NSF format.

If the submitting organization requires evaluation consultants to be selected through a competitive bid process after an award is made, the proposer should note the policy that prohibits noncompetitive selection and describe the procedures that will be used to select an evaluator after the award is made.

References Cited: A References Cited section must be included in the proposal. Literature cited should specifically relate to the proposed project, and the Project Description should make clear how each reference has played a role in the motivation for or design of the project. Relevant literature on research in teaching and learning as well as relevant literature on technical education efforts should be cited. If no references are cited, the section should state that no references were cited.

Special Information and Supplementary Documentation:

Please refer to the PAPPG for guidance. In addition to following the PAPPG, the ATE program requires:

- Letters of Collaboration that describe the expected contributions, roles and responsibilities of the partners to the project/Center are required. Letters that merely endorse the project or offer nonspecific support for project activities should not be included and the proposal may be returned without review if such letters of support are included.
- A Biographical Sketch of the external evaluator: If the evaluator or evaluation team is named in the proposal, then their Biographical Sketch(es) must be uploaded in the section in Research.gov called "Other Personnel Biographical Information", and they must follow the NSF format.
- For Center submissions only: a letter from the president or chief academic officer of the host institution documenting the institution's commitment to the Center; and
- For renewal Center submissions only: up to five pages of Results from Prior NSF Support. This section should detail outcomes and impacts resulting from prior support under the headings of Intellectual Merit and Broader Impacts.

The addition of other documents in the Special Information and Supplementary Documentation section, except those specified above or required by the PAPPG, will result in the proposal being returned without review.

Additional Information: Certain special types of proposals described in the PAPPG—i.e., Grants for Rapid Research Response (RAPID) proposals, EARly Grants for Exploratory Research (EAGER) proposals, and Accomplishment-Based Renewal (ABR) proposals are not appropriate for the ATE program and should not be submitted in response to this solicitation. Discussion with a program officer is strongly encouraged prior to submitting an unsolicited proposal to the ATE program.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

Funds requested for equipment and instrumentation essential to meet the goals and objectives of the project normally may not exceed \$300,000 for the duration of a full project grant. Exceptions to this limit will be considered when a single piece of equipment costs more than \$300,000, and the need for the equipment is justified in terms of student use and learning outcomes. If instrumentation is requested to update an existing program, the request may exceed the \$300,000 limitation if the need for the equipment is validated by industry. Equipment requests for Track 1: Small Scale Projects must be within the overall scope of the project budget. It is expected that the proposer will request educational discounts from the equipment supplier, and that any discount will be explained in the budget justification.

Equipment requests must be clearly disclosed in the proposal budget and justified in the budget justification. See 2 CFR § 200.313 for additional information.

NSF funds may not be used to support expenditures that would normally be made in the absence of an award, such as costs for routine teaching activities and laboratory upgrades (supplies and computers).

NSF project funds may **not** be used for:

- Student scholarships (please see the DUE S-STEM program for scholarships for students <https://new.nsf.gov/funding/opportunities/nsf-scholarships-science-technology-engineering>) and the DCL NSF 24-094 https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf24094;
- Equipment and related materials and supplies that an institution would normally purchase to serve common laboratory or instructional needs (e.g. computer labs, "smart" classrooms, general purpose laptop computers, projectors, cameras, audio devices, videoconferencing software, webcasting software);
- Common productivity software (e.g. Microsoft Office, Microsoft Project, Adobe Creative Cloud) and teaching aids (e.g. "drill and practice" software);
- Replacement equipment or instrumentation that does not significantly improve instructional capability;
- Vehicles, trailers, laboratory furnishings, or general utility items such as office equipment, benches, tables, desks, chairs, storage cases, and routine supplies;
- Maintenance equipment and maintenance or service contracts, unless the maintenance or service contract is built into the initial cost of the equipment;
- Construction, renovation, or modernization of rooms, laboratories or other facilities;
- The installation of equipment or instrumentation (as distinct from the on-site assembly of multi-component instruments--which is an allowable charge).

In accordance with NSF Administrative and Clerical Salaries and Wages Policy (see PAPPG Chapter II.D.2.f(i)(b) and 2 CFR § 200.413), the salaries of administrative and clerical staff should normally be treated as indirect costs (F&A). Direct charging of these costs may be appropriate only if all the conditions specified in the PAPPG and in section 413(c) of the Uniform Guidance are met.

Professional Development Conferences/Meetings: In proposals that involve professional development activities, reasonable associated travel costs and costs for subsistence (lodging and meals) may be included in project budgets. In addition, funds may be requested for a reasonable stipend per meeting day for participants; requests for such stipends must be specific to the target audience and must be fully justified—for example, to assure participation by faculty with few professional development opportunities or from institutions that justify need.

Support for Substitute Teachers: The use of NSF funds to hire substitute teachers is allowed under the following conditions: (1) it is necessary to meet the goals and objectives of the project; and (2) it can be documented that the substitute teachers are directly replacing teachers participating in the NSF-funded project. Substitute teachers should be paid in accordance with established school district policies, and in lieu of paying the teachers participating in the project. Records must be maintained on the hiring and use of substitutes.

Extra Compensation Above Base Salary. Please follow 2 CFR § 200.430. Extra service pay normally represents overload compensation, subject to institutional compensation policies above and beyond the Institutional Base Salary (IBS). The institution must have written policies that apply uniformly to all faculty, not just those working on a federal award. For institutions that support extra service pay through payment of a stipend this amount must be converted to reflect the additional total salary compensation under the budget category for Personnel, and this will be reflected in the Current and Pending (Other) Support documents.

National Visiting Committee: For ATE Center proposals, the budget should include provisions for a National Visiting Committee (NVC) to meet with the center personnel at least on an annual basis (may be virtual or in-person). An NVC is a group of experts who provide advice to the project staff, assess the plans and progress of the project (and make reports both to the project leadership and to NSF), and enhance the dissemination of the project's products. Typically, ATE Centers enlist eight to ten members. The proposal should include only the names of NVC members who have agreed to serve should an award be made. After an award is made, the cognizant NSF program officer will work with the recipient to finalize NVC membership. The proposal should address how the NVC will be used in the project.

Evaluation: The funds to support an evaluator independent of the project must be requested. The requested funds must match the scope of the proposed evaluative activities that have been developed in partnership with the Center/project team. The evaluator may be employed by a project's home institution, as long as he or she works in a separate organizational unit (e.g., a different department) that has a different reporting line than that of the project's home unit. The project should engage project staff to work with the external evaluator as a means to both improve the quality of data collected and feasibility of conducting the evaluation, and define how data will be collected by the project team or evaluator for analysis by the evaluator.

ATE PI Conference: The budget must include funds to support travel to the annual ATE PI Conference. Lodging and registration are covered by the American Association of Community Colleges for two people from each project and center. Centers may request an additional six people with lodging and registration included on the budget for the additional people. All recipients are required to showcase their progress annually at the ATE PI Conference.

C. Due Dates

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

October 03, 2024

First Thursday in October, Annually Thereafter

D. Research.gov/Grants.gov Requirements

For Proposals Submitted Via Research.gov:

To prepare and submit a proposal via Research.gov, see detailed technical instructions available at:

[https://www.research.gov/research-portal/appmanager/base/desktop?](https://www.research.gov/research-portal/appmanager/base/desktop?_nfpb=true&_pageLabel=research_node_display&_nodePath=/researchGov/Service/Desktop/ProposalPreparation)

[_nfpb=true&_pageLabel=research_node_display&_nodePath=/researchGov/Service/Desktop/ProposalPreparation](https://www.research.gov/research-portal/appmanager/base/desktop?_nfpb=true&_pageLabel=research_node_display&_nodePath=/researchGov/Service/Desktop/ProposalPreparation)

For Research.gov user support, call the Research.gov Help Desk at 1-800-673-6188 or e-mail rgov@nsf.gov.

The Research.gov Help Desk answers general technical questions related to the use of the Research.gov system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

For Proposals Submitted Via Grants.gov:

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

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

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

VI. NSF Proposal Processing And Review Procedures

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

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

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

One of the strategic objectives in support of NSF's mission is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions must recruit, train, and prepare a diverse STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance

of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

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

A. Merit Review Principles and Criteria

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

1. Merit Review Principles

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

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

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

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

2. Merit Review Criteria

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

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully

address both criteria. (PAPPG Chapter II.D.2.d(i). contains additional information for use by proposers in development of the Project Description section of the proposal). Reviewers are strongly encouraged to review the criteria, including PAPPG Chapter II.D.2.d(i), prior to the review of a proposal.

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

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

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

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

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

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

Additional Solicitation Specific Review Criteria

For the ATE program, questions such as the following are often relevant to evaluating proposals in terms of NSF's merit review criteria.

Intellectual Merit

- Does the project have potential for improving student learning in science or engineering technician education programs with detailed goals, objectives and activities?
- Is the rationale for selecting particular activities or components for development or adaptation clearly articulated and informed by the research literature? Does the work build on that base and the work of others?

- Is the evaluation plan clearly tied to the project outcomes, provide for effective assessment of student learning, and likely to provide useful information to the project and others?
- Is the evidence of institutional and industry support clear and compelling, and have plans for long-term institutionalization been addressed?

Broader Impacts

- Has an assessment of workforce needs for technicians been conducted? Does the project work with employers to address their current and future needs for technicians?
- Will the project's results be widely disseminated and will its products be distributed effectively and commercialized when appropriate?
- Are the results and products of the project adaptable at other institutions?
- Does the project promote the participation of the full spectrum of diverse talent that society has to offer in the technical workforce?

B. Review and Selection Process

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

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

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

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

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

VII. Award Administration Information

A. Notification of the Award

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

B. Award Conditions

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

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

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

Administrative and National Policy Requirements

Build America, Buy America

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

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

C. Reporting Requirements

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

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

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

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

There are two special ATE requirements. The EvaluATE Resource Hub at Western Michigan University assists the ATE community in evaluating the ATE program by conducting the ATE Annual Survey. All PIs are required to respond annually to this survey that requests information about the number and characteristics of students and educators that have been affected by the project; the retention, graduation, and placement rates for students; the project's impact on workforce needs; awards and other measures of the quality of the project's products and activities; and other indicators of the project's effect on the quality and quantity of technicians being educated for the high-tech workplace. NSF works with the EvaluATE Resource Hub to set guidelines for the collection and reporting of data.

For the second requirement, to help ensure that the valuable deliverables created through ATE funding remain available after funding ends, ATE projects and centers are required to work with ATE Central to ensure those resources are archived. Specifically, projects and centers that create resources that exist in digital form (e.g., curriculum, professional development, and recruitment materials) must provide copies of those resources in appropriate format and with clear intellectual property information to ATE Central for archiving purposes, in an archivable format and with clear intellectual property information. Details on archiving can be found on the ATE Central website (<https://atecentral.net/archiving>). Projects and centers are encouraged to work with ATE Central early in their funding period to develop a plan for preparing and migrating copies of their materials for archiving.

Additionally, it is suggested that the developer of new materials license all work (except for computer software source code, discussed below) created with the support of the grant under either the 3.0 Unported or 3.0 United States version of the Creative Commons Attribution (CC BY), Attribution-ShareAlike (CC BY-SA), or Attribution-NonCommercial-ShareAlike (CC BY-NC-SA) license.

These licenses allow subsequent users to copy, distribute, transmit, and adapt the copyrighted work and require such users to attribute the work in the manner specified by the owner of the intellectual property. Notice of the specific license used is affixed to the work and displayed clearly when the work is made available online. For general information on these Creative Commons licenses please visit <http://creativecommons.org/licenses/> .

It is expected that computer software source code developed or created with ATE grant funds be released under an intellectual property license that allows others to use and build upon the work. Recipients may release all new source code developed or created with ATE grant funds under an open license acceptable to the Free Software Foundation (<http://gnu.org/licenses>) and/or the Open Source Initiative (<http://opensource.org/licenses>).

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:

- V. Celeste Carter, Lead Program Director, telephone: (703) 292-4651, email: vccarter@nsf.gov
- Paul Tymann, Co-lead Program Director, telephone: (703) 292-2832, email: ptymann@nsf.gov

For questions related to the use of NSF systems contact:

- NSF Help Desk: 1-800-381-1532
- Research.gov Help Desk e-mail: rgov@nsf.gov

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via

telephone: 1-800-518-4726; e-mail: support@grants.gov.

For questions about specific areas of technology or disciplines proposers are encouraged to contact a Program Officer from the list below.

Biotechnology/Biology/Chemistry

- Celeste Carter, telephone: email: vccarter@nsf.gov
- Michael Davis, e-mail: mdavis@nsf.gov
- Olivia Long, e-mail: olong@nsf.gov
- Kalyn Owens, e-mail: kowens@nsf.gov

Engineering

- Nasser Alaraje, e-mail: nalaraje@nsf.gov
- Christine Delahanty, e-mail: cdehahan@nsf.gov
- Olga Pierakkos, e-mail: olpierra@nsf.gov

Evaluation/Research

- Connie Della-Piana, telephone: email: cdellapi@nsf.gov

Geographic Information Systems/Geosciences

- Keith Sverdrup, e-mail: ksverdru@nsf.gov

Information technology/Computer Science

- Paul Tymann: e-mail: ptymann@nsf.gov
- Monisha Pulimood: mpulimoo@nsf.gov

Information technology/Cybersecurity

- Corby Hovis, email: chovis@nsf.gov
- Paul Tymann: e-mail: ptymann@nsf.gov

Small Scale ATE track

- Michael Davis, e-mail: mdavis@nsf.gov
- Paul Tymann: e-mail: ptymann@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.F.7 for instructions regarding preparation of these types of proposals.

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

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

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

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

- **Location:** 2415 Eisenhower Avenue, Alexandria, VA 22314
- **For General Information** (NSF Information Center): (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**
 - Send an e-mail to: nsfpubs@nsf.gov
 - or telephone: (703) 292-8134
- **To Locate NSF Employees:** (703) 292-5111

Privacy Act And Public Burden Statements

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

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

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Reports Clearance Officer
Policy Office, Division of Institution and Award Support
Office of Budget, Finance, and Award Management
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