Advanced Technological Education (ATE)

PROGRAM SOLICITATION
NSF 14-577

REPLACES DOCUMENT(S):
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National Science Foundation

Directorate for Education & Human Resources
Division of Undergraduate Education
Research on Learning in Formal and Informal Settings

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

October 09, 2014

October 08, 2015

October 06, 2016

IMPORTANT INFORMATION AND REVISION NOTES

Changes in the ATE program solicitation for FY 2015, FY 2016, and FY 2017 include:

A new focus area for ATE projects called “ATE-Coordination Networks” is described.

The Targeted Research on Technician Education track has been expanded. This track now supports planning, exploratory research and development, and full scale research and development proposals. All projects must demonstrate substantive faculty partnerships between 2-year and 4-year colleges and universities.

Proposals submitted for a Center renewal may submit up to five pages on Results of Prior Support in the supplementary documents section of the proposal, and refer the reader to that section in the Project Description section.

The funding duration and size of award for the Centers track has been changed, and resource centers renamed to support centers.

Large Scale Material Development projects are no longer supported.

An additional requirement is described under “Reporting Requirements”. This is a requirement to work with ATE Central to archive resources developed with grant funds.

For proposals describing the development of new learning materials and computer software source code developers are encouraged to license these materials (See text under “Reporting Requirements”).

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 17-1), which is effective for proposals submitted, or due, on or after January 30, 2017.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Advanced Technological Education (ATE)

Synopsis of Program:

With an emphasis on two-year colleges, the Advanced Technological Education (ATE) program focuses on the education of technicians for the high-technology fields that drive our nation's economy. The program involves partnerships between academic institutions and industry to promote improvement in the education of science and engineering technicians at the undergraduate and secondary school levels. The ATE program supports curriculum development; professional development of college faculty and secondary school teachers; career pathways to two-year colleges from secondary schools and from two-year colleges to four-year institutions; and other activities. Another goal is articulation between two-year and four-year programs for K-12 prospective STEM teachers that focus on technological education. The program invites research proposals 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)

http://www.nist.gov/mep/index.cfm as applicable to support technician education programs and the industries they serve;
- Institutes for Manufacturing Innovation http://manufacturing.gov/nnmi.html addressing workforce development issues;
- Department of Labor Trade Adjustment Assistance Community College Career & Training (TAACCCT) program awardees http://www.doleta.gov/taaccct/; and
- NSF Industry & University Cooperative Research Program (I/UCRC) awardees. http://www.nsf.gov/eng/iip/iucrc/.

The ATE program encourages proposals from Minority Serving Institutions and other institutions that support the recruitment, retention, and completion of underrepresented students in technician education programs. NSF is particularly interested in proposals from all types of Minority Serving Institutions (including Hispanic Serving Institutions, Historically Black Colleges and Universities, Tribal Colleges and Universities, and Alaska Native and Native Hawaiian Serving Institutions) where the proportion of underrepresented students interested in advanced technology careers is growing.

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: vccarter@nsf.gov
- David B. Campbell, Lead Program Director, DRL, 885 S, telephone: (703) 292-5093, email: dcampbel@nsf.gov

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

- 47.076 --- Education and Human Resources

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 40 to 55

Anticipated Funding Amount: $64,000,000

is anticipated to be available for new and continuing awards in this program in FY2015. Funding in all years is subject to the availability of funds.

Eligibility Information

Who May Submit Proposals:

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the Grant Proposal Guide, Chapter I, Section E.

For the Small Grants for Institutions New to the ATE Program: Only community college campuses that have not had an ATE award within the past 10 years may be the "performing organization" on a proposal in this category. It is acceptable for a system administrative office or other governing organization to submit the proposal and be the "awardee organization," even if that organization has received a previous ATE award. But the campus that is the "performing organization" must not have been the performing organization on an ATE award within the past 10 years and must be geographically distinct and have its own chief academic officer.

Who May Serve as PI:

There are no restrictions or limits.

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 FastLane: *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=papp.
  - 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: http://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. submitter's local time):

  October 09, 2014

  October 08, 2015

  October 06, 2016

Proposal Review Information Criteria

Merit Review Criteria:

National Science Board approved criteria. Additional merit review considerations 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.

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I. INTRODUCTION

The Advanced Technological Education (ATE) program promotes improvement in the education of science and engineering

technicians at the undergraduate and the secondary school levels (grades 7 through 12). 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 technology courses. 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.

The ATE program focuses on colleges that award 2-yr degrees in advanced technology fields and expects these colleges to have a leadership role on all projects. Effective technological education programs should involve partnerships in which two-year colleges work with four-year colleges and universities, secondary schools, business, industry, and government, and should respond to employers' needs for well-prepared technicians with the ability to learn and embrace change.

The ATE program prepares well-qualified science and engineering technicians for existing and emerging advanced technological fields as well as preparing effective teachers for these fields. Many of these fields also play a vital role in national security and sustainable energy production and management. 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, and learning, evaluation and research. The ATE program is particularly interested in projects addressing issues in rural technician education and projects that broaden the diversity of the entry-level technical workforce including strategies to recruit veterans into technician education programs. The ATE program does not support projects that focus on students who will become health, veterinary, or medical technicians.

Activities may have either a national or a regional focus, but not a purely local one. All projects must be guided by a coherent vision of technological education--a vision that recognizes technicians as life-long learners together with the needs of the modern workplace, including employability skills, and the articulation of educational programs at different levels.

The ATE program supports projects, centers, and targeted research on technician education. A project or center is expected to communicate a realistic vision for sustainability and a plan for achievement. It is expected that at least some aspects of both centers and projects will be sustained or institutionalized past the period of award funding. Being sustainable means that a project or center has developed a product or service that the host institution, its partners, and its target audiences want continued.

To be sustainable is to ensure a center's or project's products and services have a life beyond ATE funding. For example:

- The institution commits to maintaining some of the positions for faculty hired by the project.
- Partners pledge to supply external resources to fund parts of the project after the NSF award ends.
- The institution commits to continuing to use, improve and disseminate curricula and instructional materials developed in the project.

The almost 1,400 ATE projects 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 (http://www.nsf.gov). The ATE Centers website (http://www.atecenters.org/) provides information about resources that projects may wish to adapt. Additionally, ATE Central (http://www.atecentral.net) directs users to a full range of high-impact ATE resources available online, including curricula, learning objects, and podcasts. The SCATE Center hosts a website of interest to the ATE community (http://teachingtechnicians.org). The Evaluation Center at Western Michigan University partners with ATE projects 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 (http://www.evalu-ate.org/). Past program evaluation reports and other research studies on best practices in technician education may be found at the Evaluation Center at Western Michigan University (http://www.wmich.edu/evaluation).

II. PROGRAM DESCRIPTION

A. PROGRAM TRACKS

The ATE program supports proposals in three major tracks: Projects, Centers, and Targeted Research in Technician Education.

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 which focus on the effectiveness of technician education.

1. ATE PROJECTS

ATE Projects focus on one or a few of the activities described below. Multifaceted projects that cut across some of these activity categories are encouraged.

Program Development and Improvement: These projects should increase the relevance of technician education to modern practices and assure an increased number of students with an enhanced STEM theoretical understanding and technical skills and competencies entering the high performance workplace. Proposed activities should produce a coherent sequence of classes, laboratories, and work-based educational experiences that revitalize the learning environment, course content and technical experiences for students preparing to be science and engineering technicians. Employers must be involved, and the resulting program should constitute a model that could be disseminated broadly. The program should lead students to an appropriate associate degree or specific occupational competency or certification, provide business and 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 the evaluative activities should provide evidence on the extent to which the project goals and objectives are realized.

Components of the program development and improvement process might include:

- Adapting educational materials or courses developed elsewhere or developing new ones that add rigorous STEM content to technician courses and programs;
- Developing innovative methods for using laboratory-, field- and work-based experiences to improve students' understanding of basic principles and the modern workplace;

- Using modern instrumentation and new technologies to address the knowledge, skills, and competencies needed for the evolving, converging, and emerging technical workplace;
- Integrating industry standards and workplace competencies into the curriculum including 21st century skills (www.p21.org)/employability skills (http://cte.ed.gov/employabilityskills/) ;
- Implementing strategies to support student recruitment, retention, and completion. For example, faculty-industry teams might mentor students both within the high school and the community college technician education program with follow-up as the students enter the workforce.
- Developing life-long career and educational pathways for technicians to support the changing workplace, including improving articulation between programs at secondary schools and two-year colleges, and pathways from two-year colleges to four-year college or university programs;
- Providing professional development for teachers and faculty; and
- Providing industry internships for students and/or undergraduate research experiences that build skills and competencies and introduce students to a real work experience.

Curriculum and Educational Materials Development: A project may also focus on curriculum and materials development with the intent of nationally 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 teachers. Projects develop new print, electronic, and multimedia materials, 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.

Professional Development for Educators: The ATE program supports projects that provide current secondary school teachers and college 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, and understanding of current technologies and practices, and employability skills. Activities typically include workshops, intensive seminars, industrial 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 participants should demonstrate institutional support. The program particularly encourages activities that involve secondary (grades 7 through 12) school teachers and two-year college faculty working together. Additionally, the program encourages activities that provide pedagogical skills to industry scientists and tradespeople who wish to teach. Evaluation should demonstrate use in the classrooms and sustainable changes in practice of participating faculty and teachers. Changes in student learning outcomes as well as students' perceptions of technical careers should be measured.

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 who educate technicians. 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 grantees across funding agencies. Activities that foster these skills might include:

- Mentoring programs that link experienced ATE PIs with new grantees. Activities are expected to lead to new PIs acquiring 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
- Outreach activities that reach faculty and their institutions to educate 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 mathematics, science, and technology education in K-12 schools. The preparation of future teachers who will facilitate student learning in mathematics and science and cultivate an interest in technological careers is an important component of the ATE program. ATE teacher preparation projects help prepare a future K-12 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 solving real world technology related problems using design processes and principles (See Standards for Technological Literacy, ITEA, https://www.iteea.org)

Teacher Preparation projects must involve both two-year and four-year institutions and should aim to increase the number, quality, and diversity of prospective K-12 science, mathematics, or technology teachers in pre-service or paraprofessional programs. These projects are expected to improve the 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 colleges 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 teaching these programs.

The project's evaluation plan must measure the effectiveness of efforts to recruit prospective K-12 teachers, transfer those students into four-year teacher preparation programs, enhance their understanding of advanced technologies used in the workplace, and enhance their ability to improve the technological literacy of their students. Project leaders should also be prepared to contribute to longitudinal studies that track students beyond the grant period, in order to measure the number who graduate with teaching credentials, find positions in K-12 schools, and demonstrate successful performance in the classroom.

Business and Entrepreneurial Skills Development for Students: In addition to technical skills and disciplinary content, students entering the industry environment need skills that allow them to understand and work effectively in a business environment. Many companies have a global presence, and students need to understand that the global economy affects them as employees. Another sector of the industry is comprised of small start-up companies, and these have different attributes than large established firms. Students need to understand these attributes and differences 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 in technician education programs by having them take selected business courses, by engaging students in problem-based learning using projects of interest to local industry, working with local economic investment organizations and by developing incubator programs that provide experiences for students to interact with entrepreneurs. Projects are encouraged that:

- Educate 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 and business practices into technical programs; and
- Introduce technical program students to business plans, marketing strategies, networking and interviewing skills, and characteristics of successful entrepreneurs within the context of the program.

Small Grants for Institutions New to the ATE Program: This category seeks to increase the incentive and opportunity for community colleges that have little or no previous experience with the ATE program to undertake projects to improve science and engineering technician education programs or teacher preparation programs that focus on technological education. This small grants opportunity is designed to stimulate implementation, adaptation, and innovation in all areas supported by the ATE program and to broaden the base of community colleges participating in the program. Proposers are strongly encouraged to utilize resources developed by other ATE or other NSF awardees and to consult with people from these projects and centers. Prospective PIs are encouraged to provide sufficient detail on what is being proposed to clearly inform both reviewers and NSF staff.

It is expected that some of the funded projects in this category will serve as a prototype or pilot for an idea that may be expanded in a future proposal for an ATE project. The ATE program is particularly interested in projects addressing issues in rural technician education.

Only community college campuses that have not had an ATE award within the past 10 years may be the "performing organization" on a proposal in this category. It is acceptable for a system administrative office or other governing organization to submit the proposal and be the "awardee organization," even if that organization has received a previous ATE award. But the campus that is the "performing organization" must not have been the performing organization on an ATE award within the past 10 years and must be geographically distinct and have its own chief academic officer. (Note: Community colleges that have had an ATE award within the past 10 years and other institutions may still submit a proposal for a small project under the other categories of ATE Project grants.)

Conferences and Workshops: The ATE program supports a small number of conferences, workshops, 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. Budgets for conferences and workshops 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 the conferences and workshops will be outcome based, and that the final report should contain a statement of the impacts of the event 12-18 months after completion of the event(s). Proposals for conferences and workshops may be submitted at any time during the year, but the proposers should plan on at least a 10 month lead time to allow for review and processing of the proposal. A prospective PI is encouraged to contact an ATE program officer to discuss the conference or workshop prior to submitting a proposal.

ATE Coordination Networks: The goal of the ATE coordination networks (ATE-CN) is to advance a field or create new directions in technician education by supporting faculty, industry, and other stakeholders to communicate and coordinate their research, training and educational activities across disciplinary, organizational, geographic and international boundaries. ATE-CN provides opportunities to foster new collaborations, including international partnerships, and address interdisciplinary topics. Innovative ideas for implementing novel networking strategies, collaborative technologies, and adaptation and implementation of industry-relevant curricula and best practices across disciplinary/technical areas are encouraged. ATE-CN awards are not meant to support existing networks; nor are they meant to support the activities of established collaborations.

ATE-CN supports the means by which faculty can share information and ideas, foster synthesis and new collaborations, develop common standards or industry-validated certifications, and in other ways advance science and technician education through communication and sharing of ideas. In preparing a proposal for this area it is important to briefly describe existing collaborative networks and then clearly describe the new networks to be developed. Proposals should describe expected outcomes on students in technician education programs as well as impacts on institutions and faculty.

Proposed networking activities directed to the ATE-CN should focus on a theme to give coherence to the collaboration, such as particular technologies or approaches or a broad research question. The budget will not exceed $200,000 per year over 4-yrs.

Possible ATE-CN projects:

- Coordinating advanced manufacturing, supply chain logistics, mechatronics, and other relevant centers and projects to advance the overall industry employment needs for entry-level technicians, including research into existing relevant certifications and/or the possible use of industry-validated certifications as part of the academic career pathway.
- Support a network to define industry-validated certifications/credentials within or across ATE advanced technological areas, and examine how they might be stacked and integrated into multiple career pathways, and how they specifically align to industry needs for entry-level technicians.
- Develop a network working with the NIST Manufacturing Extension Partnerships (MEPS) in advanced technological areas.

2. ATE CENTERS

The ATE program supports three types of centers: national, regional and support centers. Proposals for centers must clearly articulate a vision of technological education and must describe a workable plan for achieving that vision during the period of NSF funding as well as describing a plan for sustaining a sub-set of activities post-award. Typically, centers are recognized as leaders in a particular field or technology based on significant prior efforts. A pathway to a center may begin with several successful projects and then progress to a center proposal. Proposals for ATE centers must build upon prior efforts of both project personnel and others in the field. A center proposal must clearly describe impacts on the industry and technician education programs at the national, regional, and local levels as well as institutional impacts. ATE centers provide models and leadership for collaborations in which 2-yr colleges work with 4-yr colleges and universities, secondary schools, business, industry, and government. It is expected that a center will seek a variety of sources of support including (1) NSF, (2) the proposing educational institution or consortium, and (3) employers. 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.

Proposals for centers are expected to include a letter from the president or chief academic officer of the host institution documenting the institution's commitment to the center and describing the infrastructure that the institution has to fully support a center.

Centers have a carefully articulated mission that advances the ATE program's mission. Typical features of a center include:

- National or regional systemic reform, broad outreach, community-building, and leadership development among educational institutions, industry, professional and trade associations, educators, and practicing technicians leading to high visibility and support at the collaborating educational institutions;
- Mechanisms for counting students and incumbent workers who are recruited; achieve competencies; receive industry certifications (when relevant); participate in internships or apprenticeships; find appropriate employment; complete institutional certificates and associate degrees, and transfer to institutions for upper division work;
- Evaluation of the center's materials and services and their impact on student learning, faculty, and the center's impact on employers and on the institutions that manage the center including longitudinal studies that examine students' performance in the workplace and measure employers' satisfaction with graduates;
- Specific strategies for recruiting, retaining, and completing students (especially students from groups underrepresented in STEM fields – women, persons with disabilities, and Hispanic Americans, African Americans, Native Americans, Alaska Natives, Native Hawaiians and Pacific Island Natives), and effective mechanisms for measuring gains in recruitment,

retention, and completion;
- Collections of resources that are also linked to ATE Central, such as high-quality programs and curricula, that reflect the modern technological workplace, and dissemination of the center's materials and services through commercial publishers, journals, conferences, workshops,
- Mentoring of PIs and projects within the same and related technological fields;
- Attention to core STEM courses that provide a foundation for technical degree programs as well as articulation of courses and programs between two-year colleges and secondary schools and between two-year colleges and four-year colleges and universities; and
- A realistic plan for achieving sustainability and institutionalization of key center functions following the period of NSF funding.
- Establish communication with existing and new ATE projects in the same or related technological fields across the nation (this network is required of centers and does not constitute an ATE-CN effort).

The ATE program also offers planning grants for centers. (See Section III. Award Information and Section V. Proposal Preparation and Submission Instructions for further information.)

National Centers: National Centers must have a major national impact and visibility in the technological fields they address catalyzing a broad national network of academic institutions and industry partners. Partnerships may be national and/or regional, and all partners are expected to collaborate to improve technological education. The evaluation plan for a national center should provide evidence of impacts on institutions, faculty, students, and industry.

A new national center proposal must make a compelling case that there is a national need for a center in the particular technology and that the proposed center does not duplicate in any substantial way an existing national center or nationally-coordinated activities in the same technology. Groups of institutions contemplating a proposal for a new ATE national center should make early contact with one of the ATE Lead Program Directors to discuss whether a new center is appropriate. If so, a proposal for a national center will be reviewed on its merits, and ATE staff judgment that a proposal is appropriate in no way commits NSF to eventual funding of the proposed center.

National centers are funded for five years, after which they are eligible for a competitive grant renewal for another five years. At the end of the second round of funding a center may transition to a Support Center. This funding model applies to new centers and centers renewed after 2015.

Regional Centers: Regional centers focus on a particular field of technology and have a clear, measurable impact on the workforce and economy in a logically defined geographic region. The center's activities should be coordinated with local, regional, and statewide economic development strategic plans, and, if appropriate, any other ATE funded center that is in a related technological field. Although a regional center may have national impacts, the mission, structure, activities, and products of a regional center should be carefully designed to fit the region's particular characteristics and needs in the relevant field of technology.

Regional centers are funded for four years, after which they are eligible for a competitive grant renewal for another three years. In the second year of the renewal, the progress of the center will be reviewed to determine whether the center should be terminated or possibly transition to a support center.

Support Centers: A support center, within a technological area or combination of areas, constitutes a highly visible source of educational materials, ideas, and contacts, research and evaluation, and provides mentoring to increase leadership capacity on a national level. Support centers may focus on a particular field of technological education or cut across several technology fields to promote best practices in areas such as recruitment, retention, curriculum development, teaching practices, and industry partnerships. Leaders of these centers must demonstrate that they have already made substantial, high-quality contributions to technological education. As such it is common for support centers to take a greater leadership role in:

- Providing support and mentoring for prospective PIs that wish to start or improve educational programs in a particular field of technology;
- Establishing and supporting additional industry, business and academic partnerships;
- Promoting technician careers and visibility and the public image in the field(s) on which the Center is focused;
- Addressing technician knowledge, skills, and competencies needed for the evolving, converging, and emerging technical workplace; and
- Screening, validating, updating, and broadly distributing exemplary materials, curricula, and pedagogical practices adapted or designed by ATE centers and projects and other appropriate sources. This role also involves working with ATE Central to ensure that exemplary materials and curricula are appropriately archived and supported.

3. Targeted Research on Technician Education The goals of this track are: 1) to simulate and support research on technician education in established and emerging advanced technology fields in STEM, and 2) to build the partnership capacity between 2-year and 4-year institutions and universities to design and conduct research and development projects. Projects must clearly demonstrate partnerships between faculty at 2-yr and 4-yr colleges and universities, and the 2-yr faculty must have leadership roles on all projects. All projects must include a literature review that establishes the basis for the proposed study; a clear description of the alignment of research questions with methodologies; and be informed by the Common Guidelines for Education Research and Development http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf13126.

This track supports 3 levels of research efforts (these include applied research and research and development).

- Planning: $150,000 with a duration up to 2 years.
  - Conducting Design Research
  - Pilot Study
- Exploratory Research and Development: $300,000 total with a duration up to 2 years. These research projects may be built on results from a pilot study or design research study.
- Full Scale Research and Development: $800,000 total with a duration up to 3 years. These projects are expected to include research on and implementation with other types of participants, at other locations, under different conditions to test development efforts or innovations.

Examples of funded targeted research projects may be found on the NSF website using the awards search tool.

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

B. INFORMATION ABOUT PREVIOUS AWARDS

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

III. AWARD INFORMATION

NSF anticipates that approximately $64.0 million will be available for new and continuing awards in this program in FY2015. Funding in all years is subject to the availability of funds. The program expects to make 40-55 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 and mechanisms may be proposed after consultation with an NSF program officer. The actual number of awards and the award sizes are subject to the availability of funds and the quality of proposals received.

Anticipated number, size, and duration of new awards:

- ATE Projects: approximately 20-35 new awards, ranging from $25,000 to $300,000 per year and having a duration of up to three years, except for ATE-Coordination Network projects, which may be up to $200,000 per year for four years.
- ATE small grants for institutions new to the ATE program: approximately 12-20 awards for up to $200,000 (each) typically spread over three years. It is expected that the budget request will match the scope of the project.
- New national center proposals will be considered only if a compelling case that there is a national need for a center in the particular technology and that the proposed center does not duplicate in any substantial way an existing national center or nationally-coordinated activities in the same technology (see text above under national centers). National centers funding will be $4 million spread over five years, with the possibility of a competitive grant renewal for $4 million over an additional five years.
- Regional Centers of Excellence: up to 2 new awards for up to $3 million (each) spread over four years, with the possibility of a competitive grant renewal, normally at a lower level of annual funding, for an additional three years.
- Support Centers: up to 2 new awards for up to $1.6 million (each) spread over four years with the possibility of a competitive grant renewal.
- Planning Grants for Centers: up to 2 new awards for up to $70,000 (each) to develop well-formulated plans for future national and/or regional centers (see Section V.A ["Proposal Preparation"] for additional information).
- Targeted Research on Technician Education: up to 5 new awards, ranging from $150,00 total for up to 2 years to $800,000 total for up to 3 years.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the Grant Proposal Guide, Chapter I, Section E.

For the Small Grants for Institutions New to the ATE Program: Only community college campuses that have not had an ATE award within the past 10 years may be the "performing organization" on a proposal in this category. It is acceptable for a system administrative office or other governing organization to submit the proposal and be the "awardee organization," even if that organization has received a previous ATE award. But the campus that is the "performing organization" must not have been the performing organization on an ATE award within the past 10 years and must be geographically distinct and have its own chief academic officer.

Who May Serve as PI:

There are no restrictions or limits.

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.

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 Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=papp. Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

- 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: (http://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) 292-7827 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 the NSF FastLane system. PAPPG Chapter II.D.3 provides additional information on collaborative proposals.

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

The following instructions for particular sections of the proposal supplement or deviate from the guidance found in the GPG and the NSF Grants.gov Application Guide.

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 (e.g., women, minorities, persons with disabilities), include in the Project Description a substantive discussion of the specific strategies that the project will employ to affect the audience(s). Note: In FastLane, the Project Data Form will show up in the list of forms for your proposal only after you have (1) selected the correct Program Announcement/Solicitation No. on the Cover Sheet and (2) saved the Cover Sheet. 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 textbox, 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 college students, secondary school students, two-year college faculty members, secondary school teachers). This information is used to assign the proposal to a panel for review. Full proposals that do not address both merit review criteria in the separate textboxes will not be accepted or will be returned without review.

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 only cover awards pertaining to the new proposal. This subsection must contain specific outcomes and results including metrics to demonstrate the impact of the project activities.

Center renewal proposals **only** may submit up to 5 pages of Results of Prior Support in the supplementary documents section of the proposal. The first section of the Project Description of Center renewal proposals should state that the results of prior support are in the supplementary documents.

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 personnel; the plan for sustainability after the period of NSF funding; the evaluation plan; and the dissemination plan. For information about effective approaches to evaluation, see the following resources:

The 2010 User-Friendly Handbook for Project Evaluation

Online Evaluation Resource Library for NSF's Directorate for Education and Human Resources

Field-Tested Learning Assessment Guide (FLAG) for Science, Math, Engineering, and Technology Instructors

References Cited: A references cited page 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 page should state that no references were cited.

Facilities, Equipment and Other Resources: Proposers should include an aggregated description of the internal and external resources (both physical and personnel) that the organization and its collaborators will provide to the project, should it be funded. Such information must be provided in this section, in lieu of other parts of the proposal (e.g., budget justification, project description). The description should be narrative in nature and must not include any quantifiable financial information. See GPG Chapter II.C.i for additional information

Special Information and Supplementary Documentation:

*These are optional **except** for: 1) a listing of all of the known people (aside from participants and students) who will receive compensation from the project and their affiliation, 2) a postdoctoral researcher mentoring plan, if funding is requested to support postdoctoral researchers, 3) a data management plan, and 4) a letter from the president or chief academic officer of the host institution documenting the institution's commitment to the center and describing the infrastructure that the institution has to fully support a center (applies only to center proposals).*

If included, these sections must be concise and relevant. Reviewers will be strongly encouraged to disregard any supplementary documentation material in excess of 30 pages. These sections might include, for example, letters of commitment, a sample of previously developed (relevant) materials, a published review of such materials, or a draft of a proposed unit or module. Letters of commitment should document collaborative arrangements or pledge resources of significance to the proposal. Letters that merely endorse the proposal or offer nonspecific support for project activities should not be included.

Additional Guidance for Planning Grant Proposals: On the Cover Sheet of the proposal, the project title should begin with the words "Planning Grant for...." Planning grants are reserved for planning for a center. A proposal for a planning grant should clearly describe the activities that will take place during the planning period. It should also provide details about the workforce demands that the planning grant will address, the organizations and departments that will be (or will likely be) partners in the project, the core faculty members or administrators who will manage the project, and the criteria that will be used to judge the proposer's readiness to form an ATE center at the end of the planning period. The proposal should also outline plans for identifying and enlisting faculty from two-and four-year institutions and representatives from business, industry and public sector agencies to provide leadership for the various activities of the project or center.

Planning-grant proposals need not present elaborate plans for evaluation and dissemination.

Additional Information: Certain special types of proposals described in the GPG--i.e., Grants for Rapid Research Response (RAPID) proposals and EArly Grants for Exploratory Research (EAGER) proposals (see GPG, Chapter II, Section D.1 and 2), Equipment Proposals (see GPG, Chapter II, Section D.5), and Accomplishment-Based Renewal (ABR) proposals (see GPG, Chapter V, Section B)--are not appropriate for the ATE program and should not be submitted in response to this solicitation.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

Funds requested for equipment and instrumentation (computers, computer-related hardware, software, laboratory or field instrumentation, and scientific or industrial machinery) normally may not exceed $200,000 for the duration of a full project grant. Exceptions for this limit will be considered when a single piece of equipment costs in excess of the maximum allowable request, and the need for the equipment is justified in terms of student use and learning outcomes. Equipment requests for small, new to ATE projects should be within the overall scope of the project budget. 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 (including curriculum development) and laboratory upgrades (supplies and computers).

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

- equipment or instrumentation that is not mainly for use in the project;
- replacement equipment or instrumentation that does not significantly improve instructional capability;
- teaching aids (e.g., films, slides, projectors, "drill and practice" software);
- vehicles, trailers, laboratory furnishings, or general utility items such as office equipment (including word-processing equipment), benches, tables, desks, chairs, storage cases, and routine supplies;
- maintenance equipment and maintenance or service contracts;
- the modification, construction, or furnishing of laboratories or other buildings;
- the installation of equipment or instrumentation (as distinct from the on-site assembly of multi-component instruments--which is an allowable charge).

Professional Development Workshops: In proposals that involve professional development workshops, reasonable travel costs and costs for subsistence (lodging and meals) during the workshop may be included in project budgets. In addition, funds may be requested for a reasonable stipend per workshop 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.

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. ATE provides for extra compensation above base salary only for special situations, for example, teaching evening or weekend classes or workshops. Further, the extra compensation shall be computed at a rate not in excess of the monthly rate of the base academic year salary. Awardees must disclose the intention to pay extra compensation above the base salary in the Budget Justification section of the grant proposal. This extra compensation above the base salary must still be approved by the NSF Program Officer.

National Visiting Committee: For ATE center proposals, the budget should include provisions for a National Visiting Committee (NVC) to visit the center at least on an annual basis. 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 only include names of NVC members who have agreed to serve should an award be made. After an award is made, an NSF program officer will work with the grantee to finalize NVC membership. The proposal should address how the NVC will be used in the project. (Additional information describing the role of NVCs can be found at, http://www.wmich.edu/evalctr/ate/piresources.htm).

Evaluation: All projects and centers carry out evaluative activities. The funds to support an evaluator independent of the project or center must be requested, and the requested funds must match the scope of the proposed evaluative activities.

ATE PI Conference: The budget must include funds to support travel to the annual ATE PI Conference. Lodging is covered by the American Association of Community Colleges for a specified number of people from each project and center.

C. Due Dates

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

  October 09, 2014

  October 08, 2015

  October 06, 2016

D. FastLane / Grants.gov Requirements

For Proposals Submitted Via FastLane:

To prepare and submit a proposal via FastLane, see detailed technical instructions available at: https://www.fastlane.nsf.gov/a1/newstan.htm. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the

use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

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: http://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 FastLane are strongly encouraged to use FastLane 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: http://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 *Investing in Science, Engineering, and Education for the Nation's Future: NSF Strategic Plan for 2014-2018*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

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

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

A. Merit Review Principles and Criteria

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

1. Merit Review Principles

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

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.

Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

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

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

2. Merit Review Criteria

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

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

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

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

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

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

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

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

Additional Solicitation Specific Review Criteria

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?
- Are the goals, objectives, and outcomes and the plans and procedures for achieving them, worthwhile, well-developed, and realistic?
- 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? Does the project provide for effective assessment of student learning? Is the evaluation likely to provide useful information to the project and others?
- Is the evidence of institutional 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?
- Will the project evaluation inform others through the communication of results?
- Are the results and products of the project likely to be useful at other institutions?
- Are other educational institutions involved in project activities?
- Does the project promote diversity 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 applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

After programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications. After an administrative review has occurred, Grants and Agreements Officers perform the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A 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 a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the 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 http://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 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=papp.

C. Reporting Requirements

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

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

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

More comprehensive information on NSF Reporting Requirements and other important information on the administration of NSF awards is contained in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the

NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=papp.

There are two special ATE requirements. The EvaluATE National Resource Center at Western Michigan University (DUE-1204683) assists NSF in evaluating the ATE program by conducting the ATE Annual Survey. All PIs must 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 Center to set guidelines for the collection and reporting of data.

For the second requirement, to support project and center sustainability and data management planning and 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 at all in digital form (e.g. curriculum, professional development, and recruitment materials) must provide copies of those resources 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 (http://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 requires such users to attribute the work in the manner specified by the grantee. Notice of the specific license used would be 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. The grantee 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
- David B. Campbell, Lead Program Director, DRL, 885 S, telephone: (703) 292-5093, email: dcampbel@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@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

- Dave Campbell, telephone: (703)292-5093, email: dcampbel@nsf.gov
- Celeste Carter, telephone: (703)292-4651, email: vccarter@nsf.gov

Biotechnology/Chemistry

- Tom Higgins, telephone: (703)292-8831, email: thhiggin@nsf.gov

Engineering

- Gul Kremer, telephone: (703)292-4640, email: gkremer@nsf.gov
- Abby Ilumoka, telephone: (703)292-2703, email: ailumoka@nsf.gov
- Olga Pierrakos, telephone: (703)292-7936, email: olpierra@nsf.gov

Evaluation/Research

- Connie Della-Piana, telephone: (703)292-5309, email: cdellapi@nsf.gov

Geographic Information Systems/Geosciences

- Keith Sverdrup, telephone: (703)292-4653, email: ksverdru@nsf.gov

Information technology/Computer Science

- Mike Erlinger, telephone: (703)292-7855, email: merlinge@nsf.gov

Information technology/Cybersecurity

- Corby Hovis, telephone: (703)292-4625, email: chovis@nsf.gov

New to ATE track

- Liz Teles (Mathematics), telephone: (703)292-7197, email: ejteles@nsf.gov
- Hal Richtol (Chemistry), telephone: (703)292-4648, email: hrichtol@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 http://www.grants.gov.

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

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- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **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) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

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The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and NSF-51, "Reviewer/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

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