



# Making a Case for Support: The NSF Merit Review Criteria

Dave Brown, Co-PI Project Vision  
March 25, 2022



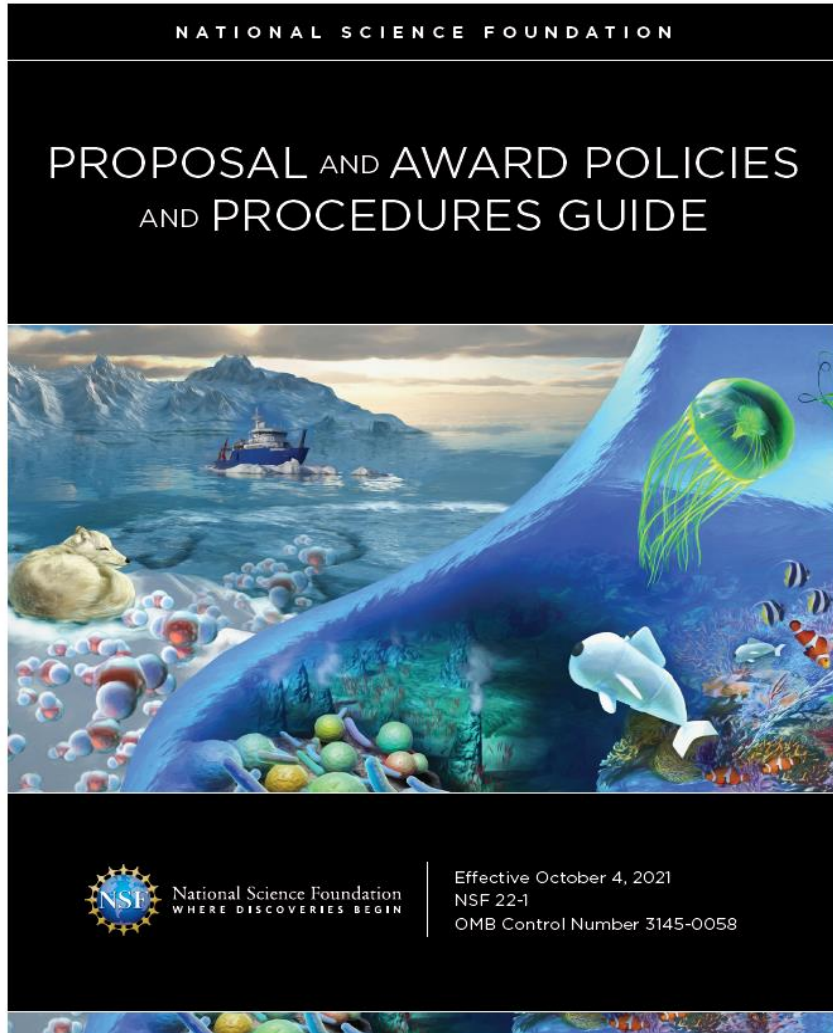
# Webinar Outline



- Overview of the Merit Review Process
- The NSF Merit Review Criteria
- Aligning the Argument for Support in an ATE proposal with the Merit Review Criteria
- General Proposal Preparation & Submission Considerations with Ties to the Merit Review Criteria
- Q&A



# ☆☆ The Stars of the Show ☆☆



Preparing ATE proposals according to the guidance provided in these hallowed documents will serve you well!

☞ PAPPG is good for thee.

☞ ATE Program Solicitation can amplify your inspiration.

## Advanced Technological Education (ATE)

**PROGRAM SOLICITATION**  
NSF 21-598

**REPLACES DOCUMENT(S):**  
NSF 18-571



National Science Foundation  
Directorate for Education and Human Resources  
Division of Undergraduate Education

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

October 14, 2021  
October 06, 2022  
October 05, 2023

### IMPORTANT INFORMATION AND REVISION NOTES

Track 1: Small Projects for Institutions New to the ATE program has a maximum budget of \$350,000 over three years.

Track 2: ATE Projects has a maximum budget of \$650,000 over three years.

ATE-Coordination Network projects are no longer supported.

A new track, Track 3, entitled "Consortia for Innovations in Technician Education" has been added.

Track 5: Targeted Research on Technician Education has been renamed Applied Research on Technician Education, and additional information has been added.

Developers 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 (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 22-1), which is effective for proposals submitted, or due, on or after October 4, 2021.

### 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 at the undergraduate and secondary institution school levels. The ATE program supports curriculum development; professional development of college faculty and secondary school teachers; career pathways; and other activities. The program invites applied research proposals that advance the knowledge base related to technician education. It is required that projects be faculty driven and that courses and programs are credit bearing, although materials developed may also be used for incumbent worker 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;
- Manufacturing USA Institutes (<https://manufacturing.gov>) addressing workforce development issues (also see DCL NSF 16-007);



# The NSF Merit Review Process



## merit noun

Save Word

mer·it | \ 'mer-ət \, 'me-rət \

### Definition of *merit* (Entry 1 of 2)

**1 a** : a praiseworthy quality : VIRTUE  
// But originality, as it is one of the highest, is also one of the rarest, of *merits*.  
— Edgar Allan Poe

**b** : character or conduct deserving reward, honor, or esteem

<https://www.vocabulary.com/dictionary/merit>

## review noun

Save Word

re·view | \ ri-'vyü \

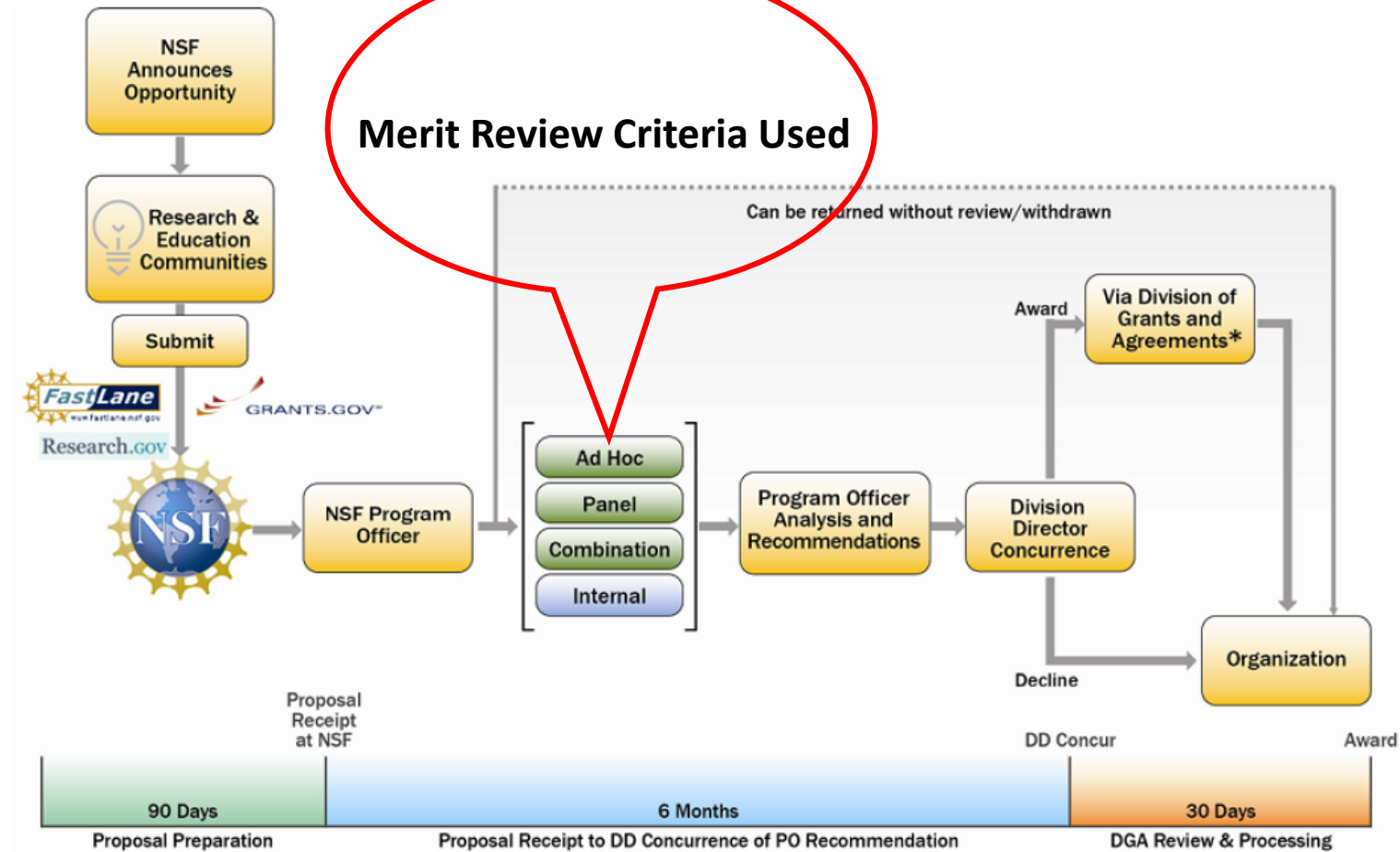
### Definition of *review* (Entry 1 of 2)

- 1 a** : a formal military inspection
- b** : a military ceremony honoring a person or an event
- 2** : REVISION sense 1a
- 3** : a general survey (as of the events of a period)
- 4** : an act or the process of reviewing
- 5** : judicial reexamination (as of the proceedings of a lower tribunal by a higher)
- 6 a** : a critical evaluation (as of a book or play)

<https://www.merriam-webster.com/dictionary/review>



# The NSF Merit Review Process



\* A small number of cooperative agreements are awarded by the Division of Acquisition and Cooperative support.

Image taken from *NSF's Merit Review Process: Fiscal Year 2020 Digest*, NSB-2021-45, p. 30.

Available online at: [https://www.nsf.gov/nsb/publications/2021/merit\\_review/FY-2020/nsb202145.pdf](https://www.nsf.gov/nsb/publications/2021/merit_review/FY-2020/nsb202145.pdf)



# Within NSF Guiding Documents: PAPPG (NSF 22-1)



When discussing types of proposal submissions, **merit review criteria** emerge:

## 3. Full Proposals

The full proposal should present the (1) **objectives** and scientific, engineering, or educational **significance of the proposed work**; (2) **suitability of the methods** to be employed; (3) **qualifications** of the investigator and the grantee organization; (4) **effect of the activity** on the infrastructure of science, engineering and education, if applicable; and (5) amount of funding required.

It should **present the *intellectual merit and broader impacts*** of the proposed project **clearly** and should be prepared with the **care and thoroughness of a paper submitted for publication**.

From PAPPG NSF 22-1: [https://www.nsf.gov/pubs/policydocs/pappg22\\_1/pappg\\_1.jsp#ID3](https://www.nsf.gov/pubs/policydocs/pappg22_1/pappg_1.jsp#ID3)



# The NSF Merit Review Criteria



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.

From PAPPG NSF 22-1: [https://www.nsf.gov/pubs/policydocs/pappg22\\_1/pappg\\_3.jsp#IIIA2a](https://www.nsf.gov/pubs/policydocs/pappg22_1/pappg_3.jsp#IIIA2a)



# The NSF Merit Review Criteria



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?

From PAPPG NSF 22-1: [https://www.nsf.gov/pubs/policydocs/pappg22\\_1/pappg\\_3.jsp#IIIA2a](https://www.nsf.gov/pubs/policydocs/pappg22_1/pappg_3.jsp#IIIA2a)





# Within NSF Guiding Documents: ATE Program Solicitation (NSF 21-598)



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From ATE Program Solicitation, NSF 21-598: [https://www.nsf.gov/publications/pub\\_summ.jsp?org=NSF&ods\\_key=nsf21598](https://www.nsf.gov/publications/pub_summ.jsp?org=NSF&ods_key=nsf21598)



# Within NSF Guiding Documents: ATE Program Solicitation (NSF 21-598)



## A. Merit Review Principles and Criteria

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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.

From p.13 of ATE Program Solicitation, NSF 21-598: [https://www.nsf.gov/publications/pub\\_summ.jsp?org=NSF&ods\\_key=nsf21598](https://www.nsf.gov/publications/pub_summ.jsp?org=NSF&ods_key=nsf21598)

(Taken *verbatim* from PAPPG: [https://www.nsf.gov/pubs/policydocs/pappg22\\_1/pappg\\_3.jsp#IIIA](https://www.nsf.gov/pubs/policydocs/pappg22_1/pappg_3.jsp#IIIA))



# Within NSF Guiding Documents: ATE Program Solicitation (NSF 21-598)



*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.*

Item 3 from three slides ago (elements of consideration for merit review criteria):

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?

Bottom Line: The language in the program solicitation *reinforces* and *emphasizes* the importance of the merit review criteria.

From p. 10 of the ATE Program Solicitation, NSF 21-598: [https://www.nsf.gov/publications/pub\\_summ.jsp?org=NSF&ods\\_key=nsf21598](https://www.nsf.gov/publications/pub_summ.jsp?org=NSF&ods_key=nsf21598)



# Within NSF Guiding Documents: ATE Program Solicitation (NSF 21-598)



**Additional Solicitation Specific Review Criteria**  Hey now! Look here!! 

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?

From p. 14 of the ATE Program Solicitation, NSF 21-598: [https://www.nsf.gov/publications/pub\\_summ.jsp?org=NSF&ods\\_key=nsf21598](https://www.nsf.gov/publications/pub_summ.jsp?org=NSF&ods_key=nsf21598)

Eyes emoji courtesy of Creative Commons License: <https://freesvg.org/emoji-eyes>

This work is supported by National Science Foundation Grant No. DUE 1826514.



# Within NSF Guiding Documents: ATE Program Solicitation (NSF 21-598)



## NSF 18-571

### Synopsis of Program:

With an emphasis on two-year Institutions of Higher Education (IHEs), 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 (grades 7-12, IHEs) and industry to promote improvement in the education of science and engineering technicians at the undergraduate and secondary institution school levels. The ATE program supports curriculum development; professional development of college faculty and secondary school teachers; career pathways; and other activities. The program invites research proposals that advance the knowledge base related to technician education. It is **expected** that projects will be faculty driven and that courses and programs credit bearing, although materials developed may also be used for incumbent worker education.

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# The NSF Merit Review Criteria: Proposal Preparation



## Forms for Temp. Proposal #8174474

The STEM Scholars

### Form Preparation

To prepare a form, click on the appropriate button below.

Form	Saved	Form	Saved
<input type="button" value="GO"/> Cover Sheet	03/14/22	<input type="button" value="GO"/> Project Summary	
<input type="button" value="GO"/> Table of Contents	N/A	<input type="button" value="GO"/> Project Description	
<input type="button" value="GO"/> References Cited		<input type="button" value="GO"/> Biographical Sketches	
<input type="button" value="GO"/> Budgets (Including Justification)	10/15/21	<input type="button" value="GO"/> Current and Pending Support	
<input type="button" value="GO"/> Facilities, Equipment, and Other Resources		<input type="button" value="GO"/> Project Data Form	01/26/22

### Supplementary Documents

- Data Management Plan
- Mentoring Plan<sup>1</sup>
- GOALI - Industrial PI Confirmation Letter
- Project Summary with Special Characters
- RAPID, EAGER, RAISE - Program Officer Concurrence

### Emails

- Other Supplementary Docs

### Single Copy Documents

<input type="button" value="GO"/> Collaborators and Other Affiliations		<input type="button" value="GO"/> Add/Delete Non Co-PI Senior Personnel	N/A
<input type="button" value="GO"/> Deviation Authorization(if applicable)		<input type="button" value="GO"/> Change PI	
<input type="button" value="GO"/> List of Suggested Reviewers (optional)	N/A	<input type="button" value="GO"/> Link Collaborative Proposals	
<input type="button" value="GO"/> Additional Single Copy Documents			
<input type="button" value="GO"/> Nature of Natural or Anthropogenic Event			



# The NSF Merit Review Criteria: Proposal Preparation



**Overview:**

**Intellectual Merit:**

**Broader Impacts:**

Save    Reset  
Go Back





# The NSF Merit Review Criteria: Proposal Preparation



## Project iLASER – Celebrating the International Year of Chemistry 2011

### Project Summary

Project iLASER (Investigations with Light And Sustainable Energy Resources) is a venture through which the **International Year of Chemistry 2011 (IYC)** will be celebrated by engaging children living along the U.S.-Mexico border in hands-on learning activities with a focus on sustainable energy, while simultaneously **Communicating Research to Public Audiences**. The two prongs of iLASER blend seamlessly, as the research to be shared originates from the **Powering the Planet Center for Chemical Innovation at Caltech (CCI Solar)**, where some of the world's foremost efforts to discover materials and processes to make it possible to power the planet with sunlight are taking place.

The goals of International Year of Chemistry are:

- To increase the public appreciation of chemistry in *meeting world needs*.
- To *encourage interest in chemistry among young people*.
- To generate enthusiasm for *the creative future of chemistry*.

Through Project iLASER the potential for powering the planet with sunlight, thereby *meeting world needs*, and the contributions of CCI Solar to make that possible will be shared with audiences along the border. The concepts behind solar fuels and clean energy production will be made real and personal with hands-on activities designed to *encourage interest in chemistry among young people*. Developing clean energy sources is one of the noblest examples of *the creative future of chemistry*.

Through the Project iLASER curriculum, students in after-school programs will take a first-hand tour through the science and technology of silicon-based photovoltaic cells and PEM hydrogen fuel cells to model electrical power production utilizing only light and water. Limitations in existing technology will be revealed, which provides an avenue to share the endeavors of scientists at CCI Solar to overcome the limitations through their research efforts.

### Intellectual Merit

The activities of Project iLASER are well-designed and follow a logical and stepwise progression, starting with basic concepts about the nature of light and culminating with cutting-edge research efforts that are made conceivable and intelligible to young folks. The activities are tied to the National Science Education Standards to supplement, reinforce and enhance regular classroom instruction. Furthermore, the project will tap into and draw upon resources from very large informal science centers and initiatives, such as the Lawrence Hall of Science and the Nanoscale Informal Science Education Network. The PI has significant experience with NSF-funded projects, STEM education and science outreach and can successfully carry out the project.

### Broader Impacts

Through Project iLASER, informal science education networks and partnerships will be created that link large, resource-abundant entities with those that have little or no access to engage children in STEM activities. The target audience is extremely economically disadvantaged and underrepresented in STEM. Project iLASER will provide materials and supplies to an impoverished citizenry, making this a transformative endeavor in capacity-building for residents of the border region. Literally thousands of students living near the border will be impacted by this project during 2011.

The theme of sustainability is timely, inspiring and of utmost importance to society. Areas near the border receive an abundance of sunlight, thus opening doors of opportunity for solar-based enterprises. Planting seeds of curiosity and inspiration with regard to powering the planet with sunlight in the minds of young residents of the border could have long-lasting impacts of great magnitude. These very students may ultimately make significant contributions to major problems facing humanity.

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<http://iyc2011.blogspot.com> and <https://cen.acs.org/articles/89/i49/Solar-Road-Trip.html>



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# The NSF Merit Review Criteria: Proposal Preparation



**The Project Description also must contain, as a separate section within the narrative, a section labeled "Broader Impacts".** This section should provide a discussion of the broader impacts of 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 the 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 U.S.; use of science and technology to inform public policy; and enhanced infrastructure for research and education. These examples of societally relevant outcomes should not be considered either comprehensive or prescriptive. Proposers may include appropriate outcomes not covered by these examples.

From PAPPG NSF 22-1: [https://www.nsf.gov/pubs/policydocs/pappg22\\_1/pappg\\_2.jsp#IIC2d](https://www.nsf.gov/pubs/policydocs/pappg22_1/pappg_2.jsp#IIC2d)



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# The NSF Merit Review Criteria: Proposal Preparation



## Facilities, Equipment and Other Resources Form

This section of the proposal is used to assess the **adequacy of the resources** available to perform the effort proposed *to satisfy both the Intellectual Merit and Broader Impacts review criteria*. Proposers should describe only those resources that are directly applicable. 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. **Reviewers will evaluate the information during the merit review process and the cognizant NSF Program Officer will review it for programmatic and technical sufficiency.**

From PAPPG NSF 22-1: [https://www.nsf.gov/pubs/policydocs/pappg22\\_1/pappg\\_2.jsp#IIC2i](https://www.nsf.gov/pubs/policydocs/pappg22_1/pappg_2.jsp#IIC2i)



# The NSF Merit Review Criteria: Proposal Preparation



## Facilities, Equipment and Other Resources Form

Recall Item 5 from the list of questions to consider when assessing merit review criteria:

5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

From PAPPG NSF 22-1: [https://www.nsf.gov/pubs/policydocs/pappg22\\_1/pappg\\_2.jsp#IIC2i](https://www.nsf.gov/pubs/policydocs/pappg22_1/pappg_2.jsp#IIC2i)



# The NSF Merit Review Criteria: Proposal Submission



**Certification Regarding Organizational Support:** The AOR is required to complete a certification that there is organizational support for the proposal as required by Section 526 of the America COMPETES Reauthorization Act of 2010. This support extends to the portion of the proposal developed to satisfy the broader impacts review criterion as well as the intellectual merit review criterion, and any additional review criteria specified in the solicitation. ***Organizational support will be made available, as described in the proposal, in order to address the broader impacts and intellectual merit activities to be undertaken.***

From PAPPG NSF 22-1: [https://www.nsf.gov/pubs/policydocs/pappg22\\_1/pappg\\_2.jsp#IIC1d](https://www.nsf.gov/pubs/policydocs/pappg22_1/pappg_2.jsp#IIC1d)



# Q&A



<https://www.thebluediamondgallery.com/wooden-tile/q/questions.html>

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