Management and Operation of the Advanced Modular Incoherent Scatter Radar (AMISR) Facilities at Poker Flat, AK, and Resolute Bay, Canada (AMISR-M&O)

PROGRAM SOLICITATION
NSF 18-552

REPLACES DOCUMENT(S):
NSF 17-539

National Science Foundation

Directorate for Geosciences
        Division of Atmospheric and Geospace Sciences

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

    June 13, 2018

IMPORTANT INFORMATION AND REVISION NOTES

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 18-1), which is effective for proposals submitted, or due, on or after January 29, 2018.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

    Management and Operation of the Advanced Modular Incoherent Scatter Radar (AMISR) Facilities at Poker Flat, AK, and Resolute Bay, Canada (AMISR-M&O)

Synopsis of Program:

    NSF hereby solicits proposals to manage and operate both of the NSF-owned faces of the Advanced Modular Incoherent Scatter Radar (AMISR) observatories that are located at Poker Flat, AK, and at Resolute Bay, Canada. These two observatories are managed and operated as a single facility which serves national goals in Geospace science research and education. These facilities are designated as Poker Flat Incoherent Scatter Radar (PFISR) and Resolute Bay Incoherent Scatter Radar - North Face (RISR-N), respectively.

    Awardees will work closely with NSF and the Geospace scientific community to ensure that each AMISR observatory supports, sustains, and advances Geospace science. In cooperation with NSF and within available resources, the Awardees will plan and execute a viable, coherent, and inclusive observing program to support Geospace research and education. AMISR activities will be carried out with guidance and oversight from NSF and through a peer review process.

    Proposals should describe how the managing institution(s) would: (1) provide observing capabilities and scientific data distribution centering on the use of each of the AMISR sites; (2) support the needs of NSF-funded, peer-reviewed research and education projects; (3) foster an integrated program of education, workforce development, and outreach; (4) develop, manage, and maintain the capabilities of the two unique sites; and (5) establish appropriate partnerships with the community, both national and international, to support AMISR research goals.

    NSF anticipates that a successful proposal for management and operations (M&O) of the AMISR facility will be awarded as a single cooperative agreement (CA). As necessary, the Awardee will define and execute a budgeted, scheduled, and tracked project plan to manage any transition from the current to the proposed model of M&O. A cooperative agreement will have a duration of five years contingent on the availability of funds. Such an award would potentially be renewable for an additional five years after a successful outcome of a comprehensive review of the awardee's performance.

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.

- Carrie E. Black, telephone: (703) 292-2426, email: cblack@nsf.gov

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

- 47.050 --- Geosciences

Award Information

Anticipated Type of Award: Cooperative Agreement

Estimated Number of Awards: 1

Anticipated Funding Amount: $15,000,000

Anticipated Award Amounts:

up to $15,000,000 for the management of both PFISR and RISR-N

This is the projected total amount of NSF funding for the 5-year duration of an award starting in FY2019 and subject to the availability of funding. NSF anticipates the potential for renewal of the award for a further five years contingent on performance, peer review, and the availability of funds.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- There are no restrictions on who may apply. Consortia may include commercial and international partnerships. However, NSF funds may be awarded only to U.S.-based organizations.

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 Proposal Submission:** Not required

- **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=pappg.
    - Full Proposals submitted via Grants.gov: *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov* guidelines apply (Note: The *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide).

B. Budgetary Information

- **Cost Sharing Requirements:**

    Inclusion of voluntary committed cost sharing is prohibited.

- **Indirect Cost (F&A) Limitations:**

    Not Applicable

- **Other Budgetary Limitations:**

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

C. Due Dates

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

    June 13, 2018

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:

Additional award conditions apply. Please see the full text of this solicitation for further information.

Reporting Requirements:

Standard NSF reporting requirements apply.

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I. INTRODUCTION

The National Science Foundation (NSF) is authorized by the National Science Act of 1950 to initiate and support basic and applied scientific research and to initiate and support programs to strengthen scientific research potential. To achieve these goals, NSF supports facilities that provide research capabilities in various scientific disciplines. The Advanced Modular Incoherent Scatter Radar (AMISR) facility provides services and infrastructure to support research and education in the Geospace sciences.

This solicitation is solely for the **management and operation** (M&O) of the NSF-AMISR observatories at Poker Flat, AK, and at Resolute Bay, Nunavut, Canada, for user and in-house research activities. It is anticipated that the competition will result in one award

that covers both AMISR sites.

II. PROGRAM DESCRIPTION

A. **Background**

Since the early 1970s, AGS has supported four incoherent scatter radar (ISR) facilities at Jicamarca, Arecibo, Millstone Hill, and Sondrestrom to provide range-resolved measurements of ionospheric parameters (electron density, ion and electron temperatures, the bulk plasma velocity, and the ion-neutral collision frequency) for the purpose of basic research. These ISR observatories were originally constructed for Department of Defense missions and re-purposed with NSF funding to support peer-reviewed Geospace research studies.

In contrast, the Poker Flat Incoherent Scatter (PFISR) and Resolute Bay Incoherent Scatter Radar-North (RISR-N), which make up the NSF-AMISR facility, were the first ISR systems supported by NSF that were specifically designed and constructed for basic research in the Geospace sciences. While the older ISR facilities are characterized by massive antenna structures and powerful, centralized transmitters, each AMISR observatory uses a phased array modular design with a large number of identical electronic subsystems. Consequently, these observatories have almost instantaneous pulse-to-pulse beam steering, remote accessibility for observing operations, and the ability to tolerate hardware failures of individual antenna element units. Following construction by SRI International, first light for PFISR and RISR-N took place in 2006 and 2009, respectively. A major PFISR upgrade to replace failed components was initiated in 2015.

NSF periodically competes the management of large facilities. This solicitation invites proposals for the M&O of AMISR with the award period to start after December 1, 2018. NSF will accept proposals to provide ongoing operations and maintenance (O&M) support for the AMISR facility, provided the proposals meet all of the requirements described in this solicitation.

B. **AMISR Facility Baseline Scope**

The AMISR facility will continue to provide the geophysical capabilities to advance the scientific goals of the AGS-supported research community, as articulated in multiple guiding documents, including the NAS 2012 Decadal Survey, and the AGS 2016 Portfolio Review Panel Report. The Portfolio Review recommendation 7.9 stated that "Funding for RISR-N should be decoupled from the funding of any other facility in order to have accurate cost analysis available." In the GS Response to the Portfolio Review and NAS Report, it is noted that "The purpose of this separation is to ensure that the AMISR site-specific objectives could be readily discerned and highlighted in each site proposal." Through specific requirements in the proposal description and the resulting cooperative agreement, this solicitation lays the foundation for fulfilling the recommendation and the intent behind it while also avoiding duplicative general management activities.

Note that the estimated annual budget amount given below should be viewed as a guideline subject to revision and the availability of funding. Budgetary and other resource requests in any given proposal must be commensurate with the scope of work proposed. The following are baseline expectations for the management and operations of the AMISR facility:

Operate and maintain instrumentation primarily for use by NSF-funded investigators for targeted research projects

- The AMISR facility will provide fundamental long-term observations of range-resolved ionospheric parameters (electron density, ion and electron temperatures, bulk plasma convection motion, and ion-neutral collision frequency). Data from each observatory will be made freely available to any user without artificial delay or restriction.
- The AMISR facility will support user-defined experiments as part of the requirement to support user-proposed observing plans at both sites (PFISR and RISR-N).
- The AMISR facility will provide logistics, field, and data ingestion support, as well as user training to enable investigator-driven research in the harsh polar environment of Alaska and Resolute Bay. Instrument support should include significant capabilities to aid optical and radio science research in harsh environments.
- AMISR will continue to participate in ISR World Days as part of its support of NSF-funded investigators. Scientific ISRs worldwide run coordinated campaigns during designated periods of time known as World Days. Experiments are proposed to the International Union of Radar Science (URSI) Incoherent Scatter Working Group which organizes the campaigns.

Manage data systems for collection, quality assurance, curation, and distribution of a large volume of diverse geophysical data products

- AMISR data management activities should include incorporation of geophysical data and metadata to the Madrigal database or its equivalent from the facility-driven experiments, PI-driven experiments, and other instrumental sources with agreement from NSF. The AMISR awardee should also be involved in community efforts to improve access to data and set data standards.

Develop and continue programs for education, workforce development, and public outreach

- In addition to contributing to Geospace scientific studies, AMISR provides excellent opportunities for distance learning and training for the next generation of radar experts. The awardee will ensure that the AMISR radar and the data are effectively used by a broad segment of the national and international scientific community.
- AMISR programs should foster integration between researchers, educators, and other experts to ensure those programs are carried out in accordance with applicable national and community standards and expand participation by underrepresented groups. Examples of such activities may include, but are not limited to, workshops and short courses; development of educational materials and software tools; and creation of new methods for distribution of information.

- The awardee will also participate in the long standing, NSF-funded, ISR summer school.

Implement a management structure for the AMISR facility

- Multiple viable management structures may exist and will be considered. Any viable structure will be required to demonstrate professional management by a highly dedicated and expert staff to be carried out in direct collaboration with the Geospace community.

C. **Description of Awardee Responsibilities**

Responsibilities:

The Awardee shall be responsible for the management, operation, and maintenance of the AMISR facility in accordance with the proposal submitted in response to this solicitation and the Annual Program Operating Plans approved by NSF prior to each year of work. The Awardee shall ensure that AMISR capabilities enable world-class research, education, and related activities in the Geospace sciences by operating and maintaining the AMISR observatories, developing and incorporating new capabilities, planning for future new initiatives, supporting a skilled and diverse work force, sustaining innovative and vigorous research and education projects awarded by NSF through the merit review process, and by enabling use of AMISR for other critical stakeholder activities.

Expectations of the Awardee:

The Awardee shall promote a culture of excellence that meets the highest standards for service to the scientific community and shall demonstrate a proactive and effective approach to facility management. A culture of excellence includes adhering to anti-harassment guidelines of the awarded institution and the anti-harassment requirements of NSF. The Awardee shall carry out all user support and research activities with direct oversight and governance from the Geospace scientific community served by AMISR operations. The Awardee will be expected to:

- Define and implement an organizational structure for the AMISR facility that provides the leadership and service to manage each observatory as a vibrant, user facility focused on the unique science at each location.
- Work with NSF to develop long term maintenance plans and carry out necessary upgrades to the facilities, this includes a solution for supplying power to RISR-N. Multiple solutions may exist, including generator replacement, and will be considered.
- Operate the AMISR observatories, PFISR and RISR-N, at full power in support of high-quality research programs and ISR World Days. ISR World Days are about 500 hours per year per facility. Assuming the facilities are fully operational, PFISR is expected to run at about 2500 hours annually and RISR-N at about 1500 hours annually. In 2015, the full power mode resulted in 2600 hours of operations for PFISR and 1600 hours for RISR-N.
- When not running in the full power mode, as feasible, operate the PFISR observatory in a low power mode to obtain continual measurements of basic ionospheric parameters. PFISR is expected to run in this mode about 5000 hours.
- There is not an expectation for RISR-N to run at low power due to operation dependencies on generators. Should a power solution include an option to support low duty cycle operations, the proposal should include a detailed plan to carry this out.
- Disseminate and publish, in a timely manner, scientific and technical results developed in the course of the project.
- Schedule, coordinate, and plan experiments making use of the PFISR and RISR-N radar systems. The awardee should implement a review process for evaluating time allocation of the AMISR radars, including steps to announce availability of time to outside scientists, criteria for allocating time, procedures for review of requests, and describe a process for resolving disputes.
- Develop and share with the scientific community software for AMISR operating modes, data acquisition, and data analysis that will aid outside users in planning and conducting experiments, as well as in using the AMISR data for scientific research.
- Assist users in the acquisition and analysis of data obtained with each AMISR face. Contribute reduced data acquired during the coordinated community experiments to the Madrigal data base or its equivalent. The data are to be reduced to physical parameters such as electron density, electron and ion temperatures, and line-of-sight velocities where appropriate to electric fields (or vector velocities or electrostatic potential). These data products are expected to be sent to the database within two months of data acquisition.
- Convene and organize workshops to facilitate AMISR science planning, demonstrate radar capabilities, and educate scientists and students on radar usage, data analysis, and data interpretation.
- Establish and maintain a single, broadly representative, community-based advisory board to provide guidance on community research activities for the AMISR facility. Guidance should be sought for each site individually and for coordinated activities between both sites.
- Assist visiting scientists in logistical arrangements, such as transportation, housing, and shipping of auxiliary site instruments.
- Draft and maintain a facility user manual.

Important Considerations in the Preparation of a Proposal:

Budgetary Considerations:

In preparing a cost-effective budget, proposing organizations are encouraged to present creative but realistic plans to deal with the long-term financial constraints imposed on the Geospace Facilities Program.

While the Large Facilities Manual (NSF 17-066; March 2017) is generally focused on investments in and operations of major facilities, much of the information in the LFM is useful for smaller facilities as well. Section 2.7 of the LFM describes applicability to smaller scale and non-MREFC funded projects. In addition, while not a requirement of this solicitation, several sections concerning Cost Estimating under LFM 4.2 (namely 4.2.1; 4.2.2; 4.2.4; and 4.2.6) provide valuable information, guidance, and references, that would assist in both development of the proposed budget and in NSF's evaluation of those proposals.

Proposed management and business structures should be described fully in the proposal, including descriptions of:

1. The proposed organizational structure, with well-defined lines of authority and responsibility within the organization;
2. Processes to track the resources dedicated to achieving the science objectives of each AMISR site;
3. Business systems capacities, including accounting systems with procedures for auditing and oversight; the ability to segregate and account separately for funding from NSF and that from other sources; procurement processes; a property management system capable of acquiring, tracking and controlling equipment funded by NSF and, separately, equipment funded by other sources; and
4. Processes for planning future operations and initiatives carried out in full collaboration with external stakeholders.

D. **General Information**

For the purpose of this solicitation Resource Libraries are available to proposing institutions. Proposers should review documents that are available through these Resource Libraries. General information is available for all organizations through the following open-access libraries. These libraries consist of 1) a link to all published AMISR-related documents located here: http://amisr.com/amisr/pubs/ and 2) access to a selection of published AMISR technical documents located here: amisr.com/database/tmp/NSF/AMISRpubs.docx.

A secure Resource Library containing technical documents is also maintained by NSF. Any proposing organization may request access by contacting the cognizant program officer. Access may be contingent upon signing a non-disclosure agreement. Further documentation may also be available upon request to NSF. Any added or updated material and any information relating to this solicitation, including NSF responses to frequently asked questions, will be made available as appropriate. For additional information on this competition, NSF practices and policies, and/or access to further information, proposing organizations should contact the Cognizant Program Officer (Carrie Black – cblack@nsf.gov).

III. AWARD INFORMATION

The estimated program budget is a maximum of $15M. One award is expected for a duration of five years. This is subject to the availability of funds.

A successful proposal will be awarded as a cooperative agreement to a single institution with subawards as necessary. NSF anticipates that the initial award commitment will be for five years, with continuation for an additional five years contingent on the availability of funds and the successful outcome of a comprehensive review of the awardee performance and facility success over the first five-year period.

All budget amounts given herein are for planning purposes only. Actual annual funding increments will be determined on the basis of an Annual Program Operating Plan that is submitted by the awardee to and approved by NSF, are subject to the availability of appropriated funds, and are contingent on the performance of the awardee.

If a new awardee is selected to replace the incumbent, NSF will fund appropriate transition costs. During this transition period, the new awardee will have appropriate access to incumbent personnel and facilities including site visit(s) as deemed necessary.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- There are no restrictions on who may apply. Consortia may include commercial and international partnerships. However, NSF funds may be awarded only to U.S.-based organizations.

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=pappg. 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: (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

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

All AMISR proposals must be submitted by a single institution (not as separately submitted "collaborative proposals"), with the lead PI as the project director. When multiple institutions are involved, budgets should be included for subawards to secondary institutions and collaborating personnel.

1. Single copy documents - Proposers must include the following as **text searchable PDFs** uploaded in Fastlane or Grants.gov as Single Copy Documents. **Proposals lacking any of these documents will be returned without review**. This list will be used by NSF to determine collaborators and other affiliations for the merit review process. The description of content of this document follows:
   1. Project Personnel - List all Senior Personnel in the project. For each person, provide the last name, first name, and institution/organization. A corresponding biographical sketch should be provided for all individuals included on this list, as instructed in Section II.C.2.f of the PAPPG. This information should be uploaded in the Single Copy Document section as "Additional Single Copy Documents." See the instructions below for details on the Biographical Sketch requirements.
   2. Collaborators and Other Affiliations Information - Follow the instructions in Chapter II.C.1.e of the PAPPG (https://www.nsf.gov/pubs/policydocs/pappg18_1/pappg_2.jsp#IIC1e) for providing this information.
2. NSF Cover page - The "Center/Research Infrastructure" type of proposal should be selected in the proposal preparation module in FastLane or Grants.gov. The title of the proposed project should begin with the string "AMISR"
3. Project Summary - The Project Summary may be no more than 1 page in length. It should clearly summarize the major features of the project and explicitly address intellectual merits and broader impacts in the text boxes provided.
4. Project Description - comprised of three separate sections with specific length conditions:
   1. Proposed Research (Maximum 50 pages) - Per guidance in the PAPPG, the Project Description must contain, as separate sections within the narrative, sections labeled "Intellectual Merit" and "Broader Impacts." The project description must also include the following:
      - A description of the proposed AMISR research by the AMISR user community and how it fits into the overall Geospace research theme;
      - Two sections, one for RISR-N and one for PFISR, describing the unique science proposed for and carried out at each site. These sections should address possible studies including, but not limited to, the coupling of dynamic processes across temporal and/or spatial scales for the magnetosphere-ionosphere-thermosphere system, and an explanation of the context and timeliness of the proposed science.
      - Describe and justify any potential plans for relocation of the PFISR facility;
      - Provide a complete list of all personnel and institutions involved in the AMISR M&O activity with explicit justification for all personnel;
      - A work plan and timeline to achieve the proposed AMISR scientific objectives;
      - A section describing any partnership and collaborative science activity;
      - Plans for disseminating the results, including the sharing of data, models, infrastructure and other tools developed as part of the proposed research;
      - Plans for student mentoring, outreach, and broadening participation in addition to the broader impacts section described above.
   2. Management Plan (Maximum 10 pages) - The management plan should describe how the proposed effort will be coordinated with the AMISR community users. The plan should also summarize how data, models, infrastructure developments and ideas will be disseminated and shared with the user community. A clear time line of expected outcomes should be included, as well as plans for the integration of research and education.
   3. Results of prior support (Maximum 1 page per team member) - At least one award for any researcher listed on the cover page on this project (PI, co-PI, collaborator, postdoc, etc.) who has received prior support from any NSF grant with an end date in the last five years must include results of prior support. If a collaborator has not had prior support, an explicit statement should be included to that effect in this section.
5. References Cited - Publications in the references section that include any of the team collaborators should have an asterisk as the first character of the reference.
6. Biographical Sketches (Maximum 2 pages per person) - For all key personnel, including senior personnel and other collaborators as necessary, please provide a brief biographical sketch. Up to five products most closely related to the proposal and up to five other significant products may be included, including those accepted for publication. Biographical Sketches must conform to the guidelines described in the PAPPG.
7. Current and Pending Support - A full description of the total level of current and pending support from all sources for the senior personnel. It is important to identify the number of salary-months covered by each source and whether these are summer, academic or calendar months.

8. Facilities, Equipment and Other Resources - A description of the facilities (including laboratories, meeting or office space, and computational facilities) that will be made available to the AMISR project. This section should also describe the contributions of unfunded collaborators and must conform to the guidelines of the PAPPG.
9. Supplementary Documents:
    1. Documentation of collaborative arrangements of significance to the proposal - Proposers should document with formal letters of collaboration any collaborative arrangements of significance in performing the proposed work. Letters of support are not permitted under this solicitation, and proposals containing such letters may be returned without review.
    2. Postdoctoral Research Mentoring Plan - Proposals that request funding for postdoctoral researchers must include a one-page mentoring plan in accordance with guidance in the PAPPG.
    3. A Data Management Plan - in accordance with guidance in the PAPPG.
    4. Transition Plan (Maximum 10 pages) - Proposing organizations, other than the incumbent, may be funded for a transition period preceding the transfer of operating authority. In this section, provide a description for the transition of M&O from the incumbent, with specific attention to uninterrupted support for AMISR science. The transition plan should include a work plan, budget, and budget justification. Additional costs and plans necessary to move an AMISR facility to a new location should be described here.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

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

Budget Preparation Instructions:

Full proposals should include a budget on the budget form in FastLane or the R&R Budget Form in Grants.gov for each year of the five-year period proposed. The proposal should provide all staffing and budgeting information needed to describe how the organization would carry out the proposed activities. Requested budget amounts for each year of the proposal should reflect the level considered necessary to perform the NSF-funded activities described in the proposal. Proposers should be cognizant of budget constraints implied by the estimated funding levels provided under Sections II and III of this solicitation.

Proposing organizations may include a fee in their proposed budget for completion of the work effort under the award. The fee must be clearly identified as such in the budget justification. If submitting through Fastlane, fee is entered on line "G (6) Other", of the NSF budget form. Fee may not be burdened with indirect rate or any other costs. Fees will be evaluated for reasonableness by NSF using a structured approach as prescribed in Agency procedures.

NSF will provide guidelines for recipients that receive fee to encourage the utmost discretion and appropriate consideration in the use of fee, to include examples of inappropriate uses of fee (e.g., including but not limited to not using fee on alcoholic beverages or lobbying as set forth at 2 CFR § 200.450 and 48 CFR 31.205-22). NSF will reserve the authority to review a recipient's actual use of fee. Accordingly, recipients must separately track and account for uses of fee provided under NSF awards. The terms and conditions of the award will specify the fee arrangement including the basis for incremental fee payments. NSF will consider reductions in future fee if a recipient's actual use of fee is in contravention with the guidelines on inappropriate uses.

C. Due Dates

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

    June 13, 2018

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: https://www.nsf.gov/bfa/dias/policy/merit_review/.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Building the Future: Investing in Discovery and Innovation - NSF Strategic Plan for Fiscal Years (FY) 2018 – 2022* . These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

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

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

A. Merit Review Principles and Criteria

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

1. Merit Review Principles

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

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

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

of those activities.

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

2. Merit Review Criteria

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

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

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

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

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

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

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

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

Additional Solicitation Specific Review Criteria

Reviewers will be asked to review the extent to which the proposed activities address the Awardee Responsibility and Expectations criteria. Specific attention will be paid to the following items:

- Scientific merit of the objectives specific to the capabilities for each AMISR site:
    - The extent to which the objectives for each location are clearly defined and take advantage of the unique research capabilities of the observatories within the auroral and central polar cap regions, respectively;
    - The extent to which the proposed research effort for each site is focused on a cohesive, well-delineated scientific goal or set of goals;
    - The degree to which the proposed scientific programs, priorities, and technical capabilities address the needs of the AMISR user community;
    - The ability to respond to and prioritize evolving scientific and engineering needs and opportunities as expressed by the AMISR user community.

- Quality and appropriateness of the Management Plan. This includes:
    - The degree to which the proposal presents a management plan, with a highly qualified project director, that includes engaging with the AMISR user community to specify possible observing strategies for user-defined experiments;
    - The quality of the proposed plans for dissemination and sharing of data, models, tools and ideas;
    - The extent to which the proposed management plan provides for the AMISR user community assessment of performance and evaluation of the AMISR facility service to the user community.

- The extent to which the proposed AMISR broader impact activities are creative and effective:
    - The appropriateness of the proposed modes of collaboration, training, and outreach to members of the AMISR user community.

B. Review and Selection Process

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

or Reverse Site Review.

Reviewers will judge proposals based on the National Science Board approved merit review criteria. They will also be asked to apply several specific criteria.

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

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants and Agreements Officer in the Division of Acquisition and Cooperative Support. 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), the Cooperative Agreement Modifications and Supplemental Financial and Administrative Terms and Conditions For Major Multi-User Research Facility Projects and Federally Funded Research and Development Centers, and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at https://www.nsf.gov/awards/managing/award_conditions.jsp? org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 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=pappg.

Special Award Conditions:

The Grants and Agreement Officer may provide special award conditions specific to this award.

Additional award conditions apply.

The award associated with this solicitation will be a cooperative agreement with the lead institution. Associated collaborators will be supported through subawards. Any special requirements not stated herein will be negotiated at time of award.

Programmatic Terms and Conditions:

The cooperative agreement(s) awarded as a result of this competition will be administered by the NSF Division of Atmospheric and

Geospace Sciences. NSF will be responsible for award oversight, including technical, programmatic, and financial and administrative performance. The following are some of the measures NSF envisions using to conduct oversight for any award of a cooperative agreement:

- Review of annual reports, program plans and performance metrics;
- Site visits as necessary;
- Annual estimated cost reviews, including identification of specific costs for each location and estimates for the splits of combined costs;
- Possible Panel Review of AMISR activities and management performance in the third or fourth year of the initial award period.

C. Reporting Requirements

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

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

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

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

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:

- Carrie E. Black, telephone: (703) 292-2426, email: cblack@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.

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.

ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

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

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

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

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

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

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

- **Location:** 2415 Eisenhower Avenue, Alexandria, VA 22314

- **For General Information** (NSF Information Center)**:** (703) 292-5111

- **TDD (for the hearing-impaired):** (703) 292-5090

- **To Order Publications or Forms:**

    Send an e-mail to: nsfpubs@nsf.gov

    or telephone: (703) 292-7827

- **To Locate NSF Employees:** (703) 292-5111

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