Platforms for Advanced Wireless Research (PAWR): Establishing the PAWR Project Office (PPO) (PAWR/PPO)

PROGRAM SOLICITATION
NSF 16-585

National Science Foundation

Directorate for Computer & Information Science & Engineering
Division of Computer and Network Systems

Preliminary Proposal Due Date(s) *(required)* (due by 5 p.m. submitter's local time):

September 20, 2016

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

November 23, 2016

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 16-1), which is effective for proposals submitted, or due, on or after January 25, 2016.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Platforms for Advanced Wireless Research (PAWR): Establishing the PAWR Project Office (PPO) (PAWR/PPO)

Synopsis of Program:

The **Platforms for Advanced Wireless Research** (PAWR) program aims to support advanced wireless research platforms conceived by the U.S. academic and industrial wireless research community. PAWR will enable experimental exploration of robust new wireless devices, communication techniques, networks, systems, and services that will revolutionize the nation's wireless ecosystem, thereby enhancing broadband connectivity, leveraging the emerging Internet of Things (IoT), and sustaining US leadership and economic competitiveness for decades to come.

In order to support the design, development, deployment, and operations of the advanced wireless research platforms, the National Science Foundation's (NSF) Directorate for Computer and Information Science and Engineering (CISE) will support the work of a PAWR Project Office (PPO). Working closely with the wireless research community, the PPO will assume responsibility for design, development, and deployment of a set of advanced wireless research platforms. Upon successful completion of the design of advanced wireless research platforms, and contingent upon support from NSF management, the PPO will proceed to the development and deployment phases with funding provided by NSF as well as a PAWR Industry Consortium. Upon successful deployment of each individual research platform, the PPO may subsequently operate the platform in service to the wireless research community.

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.

- Thyagarajan Nandagopal, Program Director, CISE/CNS, 1175, telephone: (703) 292-8950, email: tnandago@nsf.gov

- Jack Brassil, Program Director, CISE/CNS, 1175, telephone: (703) 292-8950, email: jbrassil@nsf.gov

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

- 47.070 --- Computer and Information Science and Engineering

Award Information

Anticipated Type of Award: Cooperative Agreement

Estimated Number of Awards: 1

Anticipated Funding Amount: $5,000,000

Administrative project management operations costs for the PPO are not expected to exceed $1 million per year for five years, pending availability of funds. Proposals submitted in response to this solicitation should provide a framework for pursuing design, development, deployment, and operations activities, but should **not** identify specific activities or associated sub-awardees; rather, the focus of proposals responsive to this solicitation should be upon the administrative project management operations costs described above.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in, the US acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization: 1

An organization may participate in no more than one PPO proposal submitted to this solicitation. For collaborative proposals involving multiple institutions, the proposal should be submitted by only one institution, with funding for participating institutions made through subawards. Proposals should not be submitted as separately submitted collaborative proposals. See GPG Chapter II.D.5.a for additional information.

Limit on Number of Proposals per PI or Co-PI: 1

An individual may appear as PI, co-PI, Senior Personnel or Consultant on **no more than one** PPO proposal submitted to this competition. In the event that an individual exceeds this limit, the first proposal received within the limits will be accepted based on the earliest date and time of proposal submission (i.e., the first proposal received will be accepted and the remainder will be returned without review). **No exceptions will be made**.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required

- **Preliminary Proposals:** Submission of Preliminary Proposals is required. Please see the full text of this solicitation for further information.

- **Full Proposals:**

    - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
    - 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:**

    Not Applicable

C. Due Dates

- **Preliminary Proposal Due Date(s)** *(required)* (due by 5 p.m. submitter's local time):

    September 20, 2016

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

    November 23, 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:

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

Reporting Requirements:

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

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I. INTRODUCTION

Wireless communication networks and applications have evolved to become a vital part of the nation's economic growth and productivity. The number of smartphones, connected tablets, and wearable devices in use across the US today has doubled over the last decade (CTIA Wireless Industry Survey, 2015). The burgeoning Internet of Things (IoT) is expected to add several billions of connected devices worldwide within the next 5 years (Cisco VNI, 2015). Devices will also continue to consume ever-greater amounts of data – traffic in North America is expected to continue to grow at a 42% Compounded Annual Growth Rate (CAGR) through 2020 (Cisco VNI, 2015). In order to support this unparalleled growth in devices and traffic, ubiquitous wireless connectivity at speeds covering the range from megabits per second (Mb/s) to gigabits per second (Gb/s) and with improvements in coverage, reliability, and latency will be required. Conventional 4G LTE (Long-Term Evolution) networks and public WiFi networks may not be able to meet these requirements. Consequently, wireless carriers, device and equipment vendors, and others around the world are looking towards the next generation of wireless technologies (popularly called '5G') and beyond, and policy makers are attempting to liberate more spectrum for wireless broadband applications.

In past generations of wireless technologies (e.g., 3G, 4G, WiFi), academic research in the US laid the foundations for the underlying technology [Code Division Multiple Access (CDMA), Orthogonal Frequency Division Multiplexing (OFDM), and Multiple Input Multiple Output (MIMO)]. NSF played a key role in these developments, through its long history of funding the development of advanced networking technologies. Continuing this trend of research investments, NSF has in recent years supported fundamental research in Massive MIMO, full-duplex wireless, millimeter-wave networks, dynamic spectrum sharing, network virtualization, emergent wireless network architectures, software-defined cognitive radios, wideband antennas, and dynamic tunable filters—all of which have been touted as critical components of the emerging standards in wireless technologies for both local- and wide-area networks.

Research in these topics has offered promising preliminary results in theory, simulations, and lab-scale prototypes of very small numbers of advanced wireless nodes. However, due to a lack of appropriately-sized resources available to the academic research community, it has been challenging to test these preliminary results at scale.

Therefore, NSF, in collaboration with a range of partners, intends to support at-scale experimental platforms for advancing fundamental wireless research. Through a public-private partnership, these research platforms will enable pursuit of new research challenges, enhance education about wireless technologies and data networking, further academic-industry cooperative

partnerships, and spur greater technology transfer from academia to industry.

The proposed national experimental research platforms will accelerate US research and maintain US global leadership in developing the next round of technological innovation within the wireless industry and associated services. The goal of these platforms is to support cutting-edge, multi-disciplinary experimental research on core wireless topics including, but not limited to, cloud-enabled radio access networks, radio and network protocols, antenna designs, software-defined radio transceivers, resource-sharing algorithms, spectrum sharing, use of millimeter-wave spectrum bands for mobile applications, wireless network security, network planning, heterogeneous network architectures, end-to-end network quality of service (QoS), spectrum policy enforcement, end-user application performance, and spectrum data analytics and adaptability. These platforms can also provide opportunities to validate foundational studies from the information-theory communities on wireless channels and network modeling. Importantly, these platforms for wireless research will enable innovation over the next decade and beyond, furthering the capacity of the academic research community to help envision and shape next-generation wireless communication networks beyond '5G'.

Several companies within the wireless communication ecosystem have formed a PAWR Industry Consortium that will partner with NSF on the establishment of the PPO and subsequent platforms for wireless research. The PAWR Industry Consortium shares research priorities with NSF, and will provide support within this structure to ensure a focus on relevant research while fostering greater exchange of ideas, resources, and expertise between academia and industry.

In the long term, these at-scale research platforms will collectively serve as a powerful research and development infrastructure that will support innovation in next-generation technologies giving rise to the Smart & Connected Communities (S&CC) of the future. Indeed, the proposed research platforms will benefit a multitude of research and education communities that are supported by ongoing NSF research programs (such as Networking Technology and Systems, Communication and Information Foundations, Computer Systems Research, Cyber-Physical Systems, Secure and Trustworthy Cyberspace, and Smart and Connected Health). They can be used as platforms for test and demonstration for academic research, aid in transitioning academic research to industry, and provide increased opportunities for educating the next-generation workforce.

II. PROGRAM DESCRIPTION

In order to formalize the PAWR design, development, and deployment activities, and to ensure the appropriate engagement of organizations and individuals with experience in the planning and management of research infrastructure construction projects, CISE seeks proposals from organizations seeking to serve as the PAWR Project Office (PPO). Proposers should consider the information in this Program Description when preparing submissions.

Working closely with the wireless research community and the PAWR Industry Consortium, the PPO will assume responsibility for managing all design and development activities essential to prepare for the deployment of the advanced wireless research platforms.

Upon successful completion of the multiple stages of PAWR design and development activities, and contingent upon support from NSF management, PAWR will proceed to the deployment phase with funding provided by NSF as well as by the PAWR Industry Consortium. It is anticipated that the PPO will then have full responsibility for overseeing the deployment and operations of the PAWR research platforms, ensuring that the wireless research community is able to pursue innovative research that will transform the wireless sector over the next five to fifteen years.

To ensure that all PAWR activities are driven by fundamental research opportunities in wireless networking, the PPO will work closely with the wireless research community in all aspects of the design, development, deployment, and operations of PAWR. A PAWR Steering Council (PSC), comprising a subset of the PAWR Industry Consortium, as well as research leaders in wireless networking, will represent the community's research interests in PAWR; the PSC will be chartered and supported by the PPO. The role of the PSC will be to advise the PPO in all aspects of the deployment and operations of the advanced wireless research platforms.

PPO Management

The successful operation of the PPO will require a dedicated project staff whose expertise includes: a demonstrated ability to work collaboratively with and provide services to the wireless research community; effective management of advanced networking infrastructure projects with a large wireless communication component, including planning, deployment, and operations; effective management of large-scale wireless and software-intensive projects, including design, development, implementation, and lifecycle management; technical report editing and web-based publications; communication and outreach to the broader scientific community and the general public, and interactive website development, usage, and maintenance.

The lead Principal Investigator (PI) will serve as the "Project Director" for the PPO and will work full-time on the project; thus, the PI will have direct day-to-day involvement in the effort. The Project Director must have an established track record of leadership and management of teams and projects of this scale and scope; he/she will play a critical role in the success of the project and will thus take overall responsibility for the project. The PPO Project Director will work closely with the cognizant NSF Program Officers and the PAWR Industry Consortium in order to keep all parties informed of PPO activities and to solicit input on aspects related to project planning and implementation. The PPO Project Director will also serve as an *ex officio* member of the PAWR Steering Council. The PPO Project Director will be assisted by others who bring additional scientific and administrative expertise necessary to the successful execution of PPO responsibilities. Office and meeting facilities must be available, including institutional meeting space necessary to conduct planned activities.

The PPO will be monitored by an independent evaluation team assigned by NSF, whose role is to work with the PPO to help it meet the requirements of this solicitation, provide NSF with an external independent assessment of PPO activities and progress, and collect NSF-required performance data. The PPO will be required to provide all necessary data and materials to the evaluators in a timely fashion, in order to enable the evaluators to fulfill their responsibilities.

PAWR Design and Development Phase: Identifying Advanced Wireless Research Platforms

In conjunction with the PAWR Industry Consortium, the PPO will develop a Request for Proposals (RFP) calling for the development of no more than **four** advanced experimental wireless research platforms across the country. The RFP will articulate the desired capabilities of these research platforms; the contributions that the PAWR Industry Consortium will offer to all selected awardees of the RFP; and the deployment and operational support and oversight that the PPO and the PAWR Steering Council will provide to the selected awardees. The PPO will also identify NSF deployment requirements (identified under "PAWR Design and Development Phase: Pre-Deployment Requirements" below) and solicit appropriate documentation relating to these requirements from the proposers as part of the RFP process.

The PPO will issue the initial RFP within six months of its establishment (i.e., within six months of receipt of NSF funding). The PPO will advertise the RFP throughout the wireless research community, following up with extensive outreach efforts to the various stakeholder communities, explaining the key aspects of the RFP. In response to the changing membership of the PAWR Industry Consortium and the corresponding contributions from Consortium members, the PPO will re-issue the RFP annually on an as-needed basis to reflect the nature of the contributions from the Industry Consortium. It is anticipated that the PPO will have annual deadlines for submission for the first three years.

Once the PPO receives proposals in response to the RFP, it is expected to run a merit review process, comparable to that of NSF, to evaluate the submitted proposals. While the selection of suitable proposals and topics may span multiple years, it is anticipated that, across the multiple research platforms selected by the PPO, most or all of the research thrusts of interest to NSF (see below) will be enabled.

The advanced wireless research platforms should support a diverse community of investigators across the country, in both academia and industry, in the wireless communication and networking space. Each research platform is expected to support one or more research thrusts upon deployment. Examples of anticipated research thrusts include:

1. Dynamic Wireless Spectrum Use: This thrust seeks to identify spectral usage patterns and opportunities based on existing wireless spectrum allocations, establish usage models for novel spectrum-driven applications, study co-existence and protection issues, test innovative sharing models, and demonstrate the potential for per-device wireless throughput approaching several gigabits per second using consumer-grade devices.
2. Millimeter Wave (mmWave) Spectrum Use: This thrust seeks to design devices, communication modalities, and effective network systems that can leverage the mmWave bands that are between 30 gigahertz (GHz) and 300 GHz, with a target of 100 gigabits per second (Gbps) in data rates for small-cell networks that cover a few city blocks.
3. Network Architecture: This thrust seeks to develop and demonstrate novel, programmable, and flexible data network architectures that leverage advanced Radio Frequency (RF) capabilities to enable high-performance applications for next-generation networks that operate with a wireless edge. This thrust should address: (a) mobility in the physical/network/application domains, from the transport to MAC layers; and (b) issues facing large-scale, dense, heterogeneous wireless networks, such as connection management, load balancing, mobility management, and Quality of Experience (QoE).
4. Wide-Area Wireless Backhaul: This thrust seeks to enhance rural broadband connectivity by utilizing novel wireless communication techniques, such as beamforming, dynamic spectrum, whitespaces, etc., to achieve over 1 Gbps connectivity over 50 mile-long links in order to connect remote locations via long-range wireless mesh connections.
5. Network Metrology: This research thrust seeks to advance capabilities to measure and monitor wireless network performance in terms of Quality of Service (QoS) and QoE. These capabilities must also support research on methods to improve the security, reliability and performance of wireless networks that can range from local-area networks to wide-area cellular networks and on to wireless-backhaul/satellite link-based networks.

The PPO will conduct a merit review process on an annual basis for identifying suitable platforms for advanced wireless research supporting a subset of the thrusts identified above. The awardees of the RFP should be selected based on the merit review process, in consultation with NSF and the PAWR Industry Consortium. Selected awardees of the RFP will be sub-awardees of the PPO.

PAWR Design and Development Phase: Pre-Deployment Requirements

The PPO shall work closely with the sub-awardee organization(s) to support the design, development, deployment, and operations of the corresponding research platforms. The PPO shall provide common guidelines, management structures, and operational interfaces (including modes of access to the research platforms, infrastructure test and validation procedures, equipment upgrade processes, and software design guidelines) across all of these research platforms.

After each round of merit review (once the PPO identifies potential awardees for a wireless research platform), the PPO must take the following steps prior to deployment, constituting the final design baseline for that advanced wireless research platform:

- Submit a deployment-ready research platform execution plan;
- Submit a deployment-ready PAWR research platform design, specifications, and scope of work;
- Finalize a detailed deployment plan with a bottom-up cost estimate and contingency calculations linked to risk assessment;
- Submit a detailed plan for technical and financial status reporting;
- Demonstrate successful development and prototyping of technologies essential to the platform;
- Finalize change control processes;
- Finalize a risk analysis and mitigation plan, including a security plan that protects PAWR from malicious attack or malevolent use;
- Finalize processes essential to robust software design, development and management throughout the life-cycle;
- Finalize annual operations and maintenance costs;
- Finalize the intellectual property model;
- Create the core management organization responsible for the overall deployment of the wireless research platform and finalize the staffing plan for additional staff needed to support the deployment and initial operations effort;
- Finalize commitments with academic, industry, inter-agency and international partners; and
- Establish a final baseline.

PAWR Deployment Phase and Initial Operations

Upon approval of the final design baseline for each advanced wireless research platform by NSF, PAWR deployment activities will begin for that platform.

Contingent upon the successful performance of the PPO during the design stages, it is expected that the PPO will assume all responsibility for PAWR deployment and operations. *Separate subawards will be issued by the PPO for PAWR deployment and operations for each advanced wireless research platform.* NSF will provide guidance to the PPO on each advanced wireless platform deployment and operations as that platform progresses through its lifecycle.

III. AWARD INFORMATION

Anticipated Type of Award: Cooperative Agreement

Estimated number of Awards: 1

Anticipated Funding Amount: Administrative project management operations costs for the PPO are not expected to exceed $1 million per year for five years, pending availability of funds. Proposals submitted in response to this solicitation should provide a framework for pursuing design, development, deployment, and operations activities, but should **not** identify specific activities or associated sub-awardees; rather, the focus of proposals responsive to this solicitation should be upon the administrative project management operations costs described above.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in, the US acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization: 1

An organization may participate in no more than one PPO proposal submitted to this solicitation. For collaborative proposals involving multiple institutions, the proposal should be submitted by only one institution, with funding for participating institutions made through subawards. Proposals should not be submitted as separately submitted collaborative proposals. See GPG Chapter II.D.5.a for additional information.

Limit on Number of Proposals per PI or Co-PI: 1

An individual may appear as PI, co-PI, Senior Personnel or Consultant on **no more than one** PPO proposal submitted to this competition. In the event that an individual exceeds this limit, the first proposal received within the limits will be accepted based on the earliest date and time of proposal submission (i.e., the first proposal received will be accepted and the remainder will be returned without review). **No exceptions will be made**.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Preliminary Proposals *(required)*: Preliminary proposals are required and must be submitted via the NSF FastLane system, even if full proposals will be submitted via Grants.gov.

Submitters will receive feedback from NSF Program Officers indicating either **encourage** or **discourage**. An **encourage** finding generally indicates that the proposal appears to be responsive to the program guidelines and is a candidate for further development. A **discourage** finding generally indicates that the project is not responsive to this solicitation, or has serious conceptual flaws that would not benefit from further development as a full proposal submission. The feedback provided pursuant to the preliminary proposal is advisory only; submitters of both "encouraged" and "discouraged" preliminary proposals are eligible to submit full proposals.

Submission of a Preliminary Proposal is required to be eligible to submit a Full Proposal. Preliminary proposals must be submitted, via FastLane, by 5 p.m. submitter's local time on the due date for preliminary proposals.

Preliminary proposals are started in the same way as new full proposals.

- Proposers must be sure to check the box "If this is a preliminary proposal then check here" in the middle of the cover sheet. This box appears on the cover sheet template just under the section labeled "Previous NSF Award."

Required components of the preliminary proposal are given below. Page limitations given here will be strictly enforced. Proposers should review the most current NSF *Grant Proposal Guide* (GPG) for specific information on signatures and format for the required sections.

The preliminary proposal should consist of three elements: cover sheet, project description, and biographical sketch (described below). No other sections are required, nor should they be included in the preliminary proposal.

1. Cover Sheet. The PI and all Co-PIs should be indicated. The budget indicated on the Cover Sheet should be the overall project budget total. The Project Title on the Cover Sheet should begin with "PAWR Pre-proposal", followed by a colon, followed by the project title.

2. Project Description (4-page limit). The Project Description should then have the following clearly labeled sections:

   a. Project title.
   b. Investigator information: All PIs, Co-PIs, and Senior Personnel with their institutional and departmental affiliations should be listed.
   c. A concise description of project management activities that are key to the goals and milestones for the PAWR

program. This includes a description of management needs for the project as well as other significant costs. Activities that build on ongoing efforts should include information about these current efforts.

   d. Organizational and management structure, as well as the qualifications of PPO staff.

   3. Biographical Sketch (2-page limit). A biographical sketch is required for the PI and Co-PIs on the proposal.

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 Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG 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.

See Chapter II.C.2 of the GPG 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 GPG instructions.

A proposal title must begin with "PAWR Full proposal:" For example, titles should take the form, **PAWR Full Proposal: Title**.

The Project Description section must not exceed **30 pages** including figures, charts, graphs, maps, photographs, and other pictorial representations. **Proposals exceeding this length will be returned without review.**

The Project Description **MUST** contain the following sections with the headings shown below.

Section I. Contributions of Key Personnel in the Past Five Years (up to 3 pages)

For the Principal Investigator/Project Director and other key personnel, describe their qualifications and contributions made in the most recent five years that demonstrate:

- An ability to work effectively with the US wireless research community;
- Experience with advanced networking infrastructure planning, development, deployment, and operations;
- Effective management of large infrastructure projects, including establishing project management control systems and usage of earned-value management methodology; and
- Effective management of large-scale software-intensive projects.

Reviewers will be asked to comment on the quality of the prior work described in this section of the proposal.

Section II. PPO Project Development Plan

The Project Development Plan (PDP) is the document that describes activities, budget, and schedules for all design, development, deployment, and operations activities relating to the advanced wireless research platforms (up to four platforms total).

II.1 Scope of Work

Describe in detail the scope of work necessary to go through the design, development and deployment phases, including the process of selecting the research platforms, in conjunction with NSF and the PAWR Industry Consortium, given the information provided in the Project Description section of this solicitation. Identify and discuss all project goals and associated milestones. Describe the scope of work necessary to operate the research platforms after they are deployed.

Provide a comprehensive, concise description of project management activities, aligning these activities with the goals and milestones. Provide rationale for why these activities are identified; who will lead, facilitate, and participate in them (cite backgrounds, disciplines, sectors, etc., rather than specific participant names); and the methods/metrics that will be used to evaluate the PPO's effectiveness in realizing them. Proposers should not identify specific development and development activities, instead, proposers should describe the processes that they will employ to identify, prioritize, and support necessary development and deployment activities.

II.2. Risk Mitigation Plan

Discuss any risks associated with completing the PAWR design, development, and deployment activities, including technical and organizational risks. Discuss lessons learned by the proposing team from past experiences.

II.3. Project Schedule

Provide a Gantt chart identifying key milestones and major activities over the project period. Identify and discuss the critical path from design and development to the deployment phases of the project. The schedule should show the sequencing of all major activities to be conducted in sufficient detail to justify the proposed budget. It is currently envisioned that the PPO will be prepared to host a concept design review within two months of the award, and a Preliminary Design Review (PDR) within the subsequent four-month period.

II.4. Management Plan, Organizational Structure, and Project Staffing

Describe the PPO's organizational and management structure. Describe the structure and processes to be used to provide effective governance for PAWR, including ensuring productive, collaborative interactions with the PAWR Industry Consortium, the PAWR Steering Council, and the anticipated PAWR research community. Describe the approach to be used to identify and prioritize development activities, and the competitive process to be used in the selection of development and deployment sub-awardees and consultants. Proposers should not identify specific development and deployment sub-awardees in proposals submitted in response

to this solicitation.

Provide a table that provides the following information for each individual participating in the project: name, position/title on the project, level of effort (monthly and annually), activities assigned, and responsibilities for achievement of key project goals and milestones.

Provide a functional project budget in tabular form showing how resources will be allocated.

Provide a plan for annual project critical self-assessment that includes measurable metrics, and discuss how the results of the self-assessment will be used for project improvement.

II.5. PPO Facilities

Describe office and meeting facilities that will be available for the project, including office equipment, communications capabilities, and institutional meeting space necessary to conduct project business.

Single Copy Document: In the Single Copy Documents section, upload the following:

(1) A list of Collaborators: In lieu of the instructions specified in the GPG, Collaborators and Other Affiliations Information should be submitted as follows:

Provide current, accurate information for all active or recent collaborators of personnel and institutions involved in the project. NSF staff will use this information in the merit review process to manage conflicts of interest. **This list is distinct from (1) below under Supplementary Documents in that it must include all active or recent Collaborators of all personnel involved with the proposed project.** Collaborators include any individual with whom any member of the project team -- including PIs, Co-PIs, Senior Personnel, paid/unpaid Consultants or Collaborators, Subawardees, Postdocs, and project-level advisory committee members -- has collaborated on a project, book, article, report, or paper within the preceding 48 months; or co-edited a journal, compendium, or conference proceedings within the preceding 24 months. This list should be numbered and include (in this order) Full name and Organization(s), with each item separated by a semi-colon. Each person listed should start a new numbered line.

1. Collaborators for Mary Smith; XYZ University; PI
   a. Helen Gupta; ABC University
   b. John Jones; University of PQR
   c. Fred Gonzales; DEF Corporation
   d. Susan White; DEF Corporation
2. Collaborators for John Jones; University of PQR; Senior Personnel

   a. Tim Green; ZZZ University
   b. Ping Chang, ZZZ University
   c. Mary Smith; XYZ University
2. Collaborators for Jane Brown; XYZ University; Postdoc

   a. Fred Gonzales; DEF Corporation
3. Collaborators for Bob Adams; ABC Community College; Paid Consultant

   a. None
4. Collaborators for Susan White; Welldone Institution; Unpaid Collaborator

   a. Mary Smith; XYZ University
   b. Harry Nguyen; Welldone Institution
5. Collaborators for Tim Green; ZZZ University; Subawardee

   a. John Jones; University of PQR

Supplementary Documents: In the Supplementary Documents section, upload the following information where relevant:

(1) A list of Project Personnel and Partner Institutions:

Provide current, accurate information for all personnel and institutions involved in the project. NSF staff will use this information in the merit review process to manage conflicts of interest. The list **must** include all PIs, Co-PIs, Senior Personnel, paid/unpaid Consultants or Collaborators, Subawardees, Postdocs, project-level advisory committee members, and writers of letters of support. This list should be numbered and include (in this order) Full name, Organization(s), and Role in the project, with each item separated by a semi-colon. Each person listed should start a new numbered line. For example:

1. Mary Smith; XYZ University; PI
2. John Jones; University of PQR; Senior Personnel
3. Jane Brown; XYZ University; Postdoc
4. Bob Adams; ABC Community College; Paid Consultant
5. Susan White; Welldone Institution; Unpaid Collaborator
6. Tim Green; ZZZ University; Subawardee

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

C. Due Dates

- **Preliminary Proposal Due Date(s)** *(required)* (due by 5 p.m. submitter's local time):

  September 20, 2016

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

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 the GPG as 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. (GPG 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 GPG 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

In consideration of a proposal's Intellectual Merit and Broader Impacts, the following review criteria will guide the reviewers' evaluation:

- Comment on the capabilities of the proposing team. Does the proposing team demonstrate strong experience—managerial, technical, and administrative—in projects similar in scope to that proposed here? Do prior contributions provide convincing evidence that the proposers understand and are prepared to handle the major challenges of this project? Does the proposing team have experience working with the wireless research community, deploying wireless infrastructure, and running large, software-intensive projects?
- Do the goals, milestones, and activities proposed in the Project Development Plan cover all the essential aspects of PAWR design and development?
- Does the submitting organization provide a reasonable plan for risk mitigation? Are some foreseeable risks not adequately addressed?
- Does the project schedule appear reasonable? Were the key milestones identified?
- Does the submitting organization provide an adequate management plan? Is the managerial, organizational, and governance approach appropriate for an effective PPO? Is the proposed competitive bidding process for establishing these platforms open and consistent with NSF's established review process?

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, Reverse Site Review, or Internal Review by the PAWR Industry Consortium.

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 *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

Special Award Conditions:

The PPO, in consultation with the cognizant NSF Program Officers and the PAWR Industry Consortium, will review and approve subcontracts and consultants.

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 *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

The PPO will be monitored by an independent evaluation team assigned by NSF, whose role will be to work with the PPO and help it adhere to the requirements of this solicitation, provide NSF with an external independent assessment of PPO activities and progress, and collect NSF-required performance data on a biannual basis. The PPO is required to provide all necessary data and materials to the evaluation team in a timely fashion, in order to enable the evaluators to fulfill their responsibilities.

The activities of the PAWR Project Office will also be monitored through quarterly interim progress reports. In lieu of a fourth-quarter report, an annual report on progress and plans will be submitted by the awardee to the cognizant NSF Program Officers. NSF will provide the format for these reports within one month of the award date. Both quarterly and annual reports must address progress of the PAWR Project Office regarding the duties outlined in this solicitation. If a Grantee-Approved No-Cost Extension to the project is exercised by the awardee organization, prior notification shall be provided to the cognizant Program Officers at least 60 days prior to such activity, and an interim annual report should be submitted along with said notification.

Once the PPO is selected, a site visit will be conducted. At a minimum, the PPO team, other NSF staff as needed, and an external peer review team will conduct annual site visits. The PPO team members will travel to NSF headquarters in Arlington, VA, for a mid-year briefing with NSF.

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:

- Thyagarajan Nandagopal, Program Director, CISE/CNS, 1175, telephone: (703) 292-8950, email: tnandago@nsf.gov

- Jack Brassil, Program Director, CISE/CNS, 1175, telephone: (703) 292-8950, email: jbrassil@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 provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 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 http://www.nsf.gov

- **Location:**   4201 Wilson Blvd. Arlington, VA 22230

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

- **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

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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

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

Suzanne H. Plimpton
Reports Clearance Officer
Office of the General Counsel
National Science Foundation
Arlington, VA 22230

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The National Science Foundation, 4201 Wilson Boulevard, Arlington, Virginia 22230, USA
Tel: (703) 292-5111, FIRS: (800) 877-8339 | TDD: (800) 281-8749

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