US-EU Internet Core & Edge Technologies (ICE-T)

PROGRAM SOLICITATION
NSF 18-535

National Science Foundation

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

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

May 07, 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:

US-EU Internet Core & Edge Technologies (ICE-T)

Synopsis of Program:

The Division of Computer and Network Systems (CNS) within the National Science Foundation's (NSF) Directorate for Computer and Information Science and Engineering (CISE) supports research and education activities that seek to develop a better understanding of the fundamental properties of computer and network systems. The Networking Technology and Systems (NeTS) program in the CNS division supports transformative research on fundamental scientific and technological advances leading to the development of Next Generation Internet (NGI) and Advanced Wireless Networking (AWN) systems and technologies.

NSF/CISE and the European Commission's (EC) Directorate General for Communication Networks, Content and Technology (DG CONNECT) seek to enable US and European Union (EU) researchers to collaborate to address compelling research challenges in NGI and AWN. Topics of interest include, but are not limited to, software-defined infrastructures; network function virtualization; resource management in support of content delivery; open data architectures for shared, federated research infrastructures; advanced wireless technologies; and research software tools to support advanced wireless and smart city/community testbeds.

This NSF solicitation is expected to align with a related effort in the EC's Horizon 2020's Work Programme for 2018-2020. For funding under this solicitation, US investigators must describe: 1) collaborative research, 2) research collaboration initiation activities, or 3) research fellowships with counterpart EU investigators who have received, or are requesting funding separately under the EC Horizon 2020 Programme area on Information and Communication Technologies (ICT).

As such, NSF's ICE-T program will support awards in three classes:

- *Research Collaboration (RC)* awards support collaborative research partnerships, pairing investigators at US institutions with EC-funded ICT investigators at EU institutions (or EU investigators who are requesting funding separately from the EC), for periods of up to 3 years.

- *Research Collaboration Initiation (RI)* awards support the establishment of entirely new collaborations, pairing investigators at US institutions with EC-funded investigators at EU institutions (or EU investigators who are requesting funding separately from the EC), to pursue preliminary research investigations for periods of up to 1 year.

- *Research Fellowships (RF)* awards support graduate students at US institutions to travel to EU institutions to engage in *in situ* research collaborations with EC-funded investigators (or EU investigators who are requesting funding separately from the EC) for fellowship periods of 2-6 months, and an award duration of up to 1 year.

NSF/CISE and DG CONNECT recognize the opportunity for the US and EU to jointly benefit from international research collaborations in NGI and AWN that will accelerate the creation of a global, human-centric internet. This solicitation seeks to advance this opportunity by supporting US investigators to work in collaboration with EU investigators, toward increased understanding of core and edge network technologies and systems.

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.

- John "Jack" Brassil, telephone: (703) 292-8950, email: jbrassil@nsf.gov

- Monisha Ghosh, telephone: 703-292-8746, email: mghosh@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: Standard Grant

Estimated Number of Awards: 20

NSF anticipates up to approximately five RC awards, five RI awards, and 10 RF awards subject to the availability of funds and quality of proposals received.

Anticipated Funding Amount: $2,500,000

Each RC award may be up to $300,000 over three years, and will be made to US organizations, pending availability of funds. Each RI award may be up to $100,000 over up to 1 year, and will be made to US organizations, pending availability of funds. Each RF award may be up to $50,000 over up to 1 year, with a fellowship duration of 2-6 months, and will be made to US organizations, pending availability of funds.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.

Who May Serve as PI:

PIs, co-PIs or other senior project personnel must hold primary, full-time, paid appointments in research or teaching positions at US-based campuses/offices of eligible organizations.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

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

An individual can participate as PI, co-PI, or Senior Personnel, or Consultant on **no more than one proposal** submitted in response to this solicitation. **These eligibility constraints will be strictly enforced in order to treat everyone fairly and consistently**. In the event that an individual exceeds this limit, proposals received within the limit will be accepted based on 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 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:**

  Not Applicable

C. Due Dates

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

  May 07, 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.

TABLE OF CONTENTS

I. INTRODUCTION

NSF's CISE Directorate and the EC's DG CONNECT have a long history of collaboration that has focused on future internet experimental infrastructures. Complementary networking and computing research infrastructures have been developed in parallel in the US and the EU. In 2007, US researchers established the NSF-funded Global Environment for Network Innovations (GENI), and in 2008 EU researchers established the EC-supported Future Internet Research & Experimentation project (FIRE).

To coordinate US and EU activities and advance experimentally driven networking and computer systems research, multiple GENI-FIRE technical coordination workshops were held in both the US and EU. This series of workshops grew organically out of an informal agreement between the GENI and FIRE project teams to advance the following statement of joint interests:

"The EU and US research communities wish to perform collaborative research, on the basis of equality and reciprocity, in areas of mutual interest, which may be characterized as (a) investigations of the research infrastructures suitable for hosting at-scale experimentation in future internet architectures, services, and applications, and (b) use of such infrastructures for experimental research. We envision that our collaboration will encompass joint specification of system interfaces, development of interoperable systems, adoption of each other's tools, experimental linkages of our testbeds, and experimentation that spans our infrastructures. We further envision that students and young professors from the US and EU will visit each other and collaborate deeply in these activities, in hopes of sparking friendships and life-long research collaborations between the communities."

As the research infrastructures developed and supporting programs evolved, several additional joint research workshops were held by the GENI and Fed4FIRE (Federation for FIRE) teams, along with their sponsors at NSF/CISE and DG CONNECT. These workshops were held at locations alternating between the US and EU countries. These workshops have helped guide the development of increasingly interoperable and interconnected experimental testbeds that have served researchers from both the US and EU. The success of these activities led the research community to seek to further broaden international participation at future workshops. Invitations were extended to researchers in Japan, Brazil, and South Korea for follow-on workshops.

Members of the research community have also recognized an opportunity to leverage this successful US-EU collaboration, and to broaden it beyond its past focus on experimental research infrastructures. Toward that end, a networking research planning workshop was convened in June 2017, co-located with DG CONNECT's Net Futures 2017, in Brussels, Belgium. US and EU researchers discussed potential research topic areas and activities for which US-EU collaboration would be of mutual interest and community benefit. The workshop report highlighted numerous areas of opportunity for collaborative research in both AWN and NGI.

This solicitation seeks to advance this opportunity by supporting US investigators to work in collaboration with EU investigators, toward increased understanding of core and edge network technologies and systems. This solicitation is being issued in accordance with the Implementation Arrangement signed by EC Commissioner Carlos Moedas and US Ambassador to the EU Anthony L. Gardner on October 17, 2016. That arrangement facilitates cooperation between US organizations and Horizon 2020 participants in cases where the US organizations are funded by US funding sources, and Horizon 2020 participants are funded by EU funding sources.

II. PROGRAM DESCRIPTION

Proposals are solicited for US investigators to conduct foundational and transformative research consistent with the theme of "Internet Core and Edge Technologies" in collaboration with colleagues in the EU. Proposal topics of interest include, but are not limited to, the areas listed below.

NGI Core Technologies

Research in core networking technologies supports the growing complexity of managing communication paths, and managing computation along those paths. Advances in core technologies focus on improving the performance, flexibility and availability of end-to-end communication, where the extent of communications could span a data center, enterprise, compute cloud, or national or global internet. The following are examples of topics of interest in this area:

1. *Software Defined eXchanges (SDXs)*

   Emerging SDXs promise to facilitate programmatic control and enforcement over peering policies. SDXs provide a previously unavailable opportunity to innovate in inter-domain routing protocols at scale, and permit investigators to control network behavior at either individual exchange points or along an end-to-end path. Potential research challenges include:

   - Exploring how the flexibility of intra-domain SDN can be extended across domains: How should the policy needs of each domain's stakeholders (i.e., operator and users) be expressed and enforced? What information should flow between the stakeholders and how should it be disseminated? What programming languages can be used to express and reason about these policies? What trust issues are encountered in end-to-end path provisioning, and how can those issues be addressed? How do we design SDX control, management, and data planes?

2. *Network Functions Virtualization (NFV)*

   Virtualized Network Functions (VNFs) such as software firewalls and load balancers represent building blocks that can be combined or *chained* (see below) to deliver complex networking communication services. In addition to providing low-cost services, NFV allows for dynamic, elastic compute and network provisioning which can lead to the rapid instantiation of agile

services to match time-varying workload requirements via VNF instance scale out/in or up/down. Potential research opportunities include:

- Exploring how to increase scalability, fault tolerance, and performance (e.g., throughput, latency) of network functions and service function chains, and enabling NFV to support novel use cases (e.g., edge services). Topics of interest include VNF placement, scaling and load balancing among multiple VNF instances, efficient and seamless VNF state migration, dynamic service function chaining, and distributed management of VNFs.
- Investigating interoperability in order to chain functions from different vendors and/or operators into a single service: What open, standardized descriptors for resources, functions, and services that advance existing approaches and models [e.g., Topology and Orchestration Specification for Cloud Applications (TOSCA) templates, Network Configuration Protocol (NETCONF)/YANG data modeling languages] will best support emerging NFV-specific requirements?

3. *"Horizontal" Resource Management*

End-to-end resource management envisions new mechanisms for service providers and network operators to work together to support the control and distribution of content and service delivery. Potential research challenges include:

- Defining abstractions and interfaces that allow the different stakeholders to coordinate resource allocation decisions explicitly: How should offered and/or requested resources be specified? What approaches to service "guarantees" are viable? How can the stability of dynamic allocations be guaranteed? How can providers ensure that internal policy and business requirements are satisfied, while limiting unnecessary exposure of internal information and policies? How can resource allocation algorithms to capitalize on new interfaces, and apply data analytics to optimize system performance?

4. *User-Centric Interfaces*

Improving end-user Quality of Experience (QoE) might require broadening existing network interfaces to support endpoint protocols that can adapt to network-wide measurement and monitoring. New interfaces should be able to express user-specified policies provided by endpoints — for example, regarding middle box treatment — while also allowing end points to extract information about network properties (at various granularities such as paths, path segments, and so on). While endpoint software and end protocols such as multipath TCP strive for greater awareness of network properties for steering traffic along multiple paths, the growth of encrypted traffic payloads and protocol headers (e.g., QUIC) can diminish both path segment and end-to-end network "visibility." Research in this area includes:

- Exploring richly expressive mechanisms to represent policies for network treatment of end-to-end flows (e.g., specifying a performance or forwarding objective) under a set of policy constraints such as national border-aware routing: How can "widened" communications between applications on endpoints and functions in the network enhance user control of network behavior?

AWN Edge Technologies

Research in advanced wireless networking technologies supports the growing complexity of meeting and managing the demand for higher network bandwidths and lower latency, while addressing fundamental challenges of scale, complexity and security. Many of these challenges can be effectively investigated using current US and EU investments in experimental research infrastructure for smart cities/communities and wireless research (e.g., ORBIT, SmartSantander). In the future, these challenges may also be examined on anticipated experimental research infrastructures such as the Platforms for Advanced Wireless Research (PAWR). Research opportunities span radio access technologies, expanding knowledge through experimental data sharing, and frameworks for security and privacy in edge computing systems, including Internet of Things (IoT). The following are examples of topics of interest in this area:

1. *Advanced Radio Technologies*
   - Investigating emerging radio technologies such as millimeter wave, coordinated radio frequency spectrum-sharing, and massive multi-user MIMO. In addition to fronthaul networks, backhaul networks and related high-performance fixed networking services may be considered.
   - Examining specialized use-case driven communication technologies including ultra-low-power, ultra-low-latency communications, visible light communications, and short range communications. These technologies can support emerging applications such as augmented reality and vehicular communications (e.g., vehicle-to-vehicle, vehicle-to-infrastructure).
2. *'Softwarization' of Wireless systems*
   - Investigating Software-Defined Radio (SDR)-based devices, and baseband signal processing in distributed base-station architectures such as Cloud Radio Access Networks (CloudRANs).
   - Experimenting with virtualized, mobile packet core network implementations and architectures to explore hierarchical edge computing in edge networks.
3. *Advanced Wireless Research Infrastructure*
   - Joint investigations of information and/or architectural frameworks, and software tools and technologies in support of deploying advanced wireless research experimental platforms for use by US and EU researchers. Investigations may include common management platform and operations frameworks, testbed federation, cross-testbed experimentation, and improving testbed availability and usability.

Crosscutting Research Areas

Crosscutting research areas examine "horizontal" network capabilities that span both edge and core networks. Advances in crosscutting technologies include:

1. *Measurement and Monitoring*

The vision of a fully autonomous, data-driven network will demand advances in network measurement and monitoring. Monitoring is particularly challenging at the network edge. Challenges are associated with heterogeneous technologies operating in diverse environments; obtaining monitoring vantage points; and instrumenting devices due to portability, privacy, and user incentive concerns. Research challenges may include:

Exploring approaches to collect end-to-end network characteristics and behaviors including information about services, infrastructure, user demand, and user QoE, given that this information is broadly distributed across multiple stakeholders. State-exchange mechanisms should ensure information dependability (i.e., correctness, consistency, performance), completeness, and availability while limiting the complexity of optimization processes. Investigations of incentives for stakeholders will be crucial to the successful deployment of large-scale measurement and monitoring capabilities.

- Given the role of the Internet as a critical infrastructure, policy makers and regulators in the US and EU will face similar questions of when and how to regulate future internet services. Joint, interdisciplinary research can help by defining standard metrics and shared measurement methods as a common basis for policy decisions.

2. *Privacy, trust, and security*

Emerging NFV, SDN, and cloud computing technologies increase the flexibility of network services but introduce new challenges with regard to *trust* (see below). Chains of VNFs may involve larger numbers of stakeholders than traditional system implementations, potentially with more diverse interests. NFV infrastructure must be trustworthy to deploy and allocate network functions, and VNFs from multiple vendors will need to be evaluated for trustworthiness. There is also a need to further investigate establishing trusted relationships among SDN control and/or data plane elements in a vertical and horizontal manner, particularly for inter-domain deployments. Research opportunities include:

- Exploring mechanisms to ensure trust between software-defined, virtualized infrastructures, and management applications and/or orchestrators. How can placement of VNFs (e.g., caches in untrusted locations or countries) be made trust-aware?
- Analyzing laws and regulations that vary across countries, and the diverse approaches for managing security and privacy concerns. Country differences represent a unique challenge appropriate for a US-EU partnership activity.

3. *Open Experimental Data Exchange Technologies*

The research community sees opportunity in creating a complementary set of research purpose-oriented experimental platforms and infrastructures. Synergies can be realized across multiple platforms by developing architectures, interfaces and tools leveraging support of a common data collection and management standard (e.g., open data management protocol). Such investigations would advance our joint understanding of experimental results, increase the usefulness of individual research efforts, and lower the barriers to entry for both experimenters and platform operators. Investigations could explore schemes such as distributed ledgers to support new ways of sharing research data in a trusted fashion.

III. AWARD INFORMATION

Proposals must be submitted in response to this solicitation by the US component of a US-EU project team. US and EU investigators will be supported by separate, independent funding mechanisms. US investigators will be funded by the NSF via an NSF grant. Support for EU investigators is anticipated to come from EU funding sources, possibly including mechanisms as determined by the Horizon 2020 Work Programme for 2018-2020, or comparable programs, pending the availability of funds.

In terms of the US (NSF) funding, it is anticipated that approximately 20 awards totaling $2,500,000 will be made to US organizations, pending the availability of funds. NSF anticipates supporting up to approximately five RC awards, five RI awards, and 10 RF awards, subject to the availability of funds and quality of proposals received.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.

Who May Serve as PI:

PIs, co-PIs or other senior project personnel must hold primary, full-time, paid appointments in research or teaching positions at US-based campuses/offices of eligible organizations.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

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

An individual can participate as PI, co-PI, or Senior Personnel, or Consultant on **no more than one proposal** submitted in response to this solicitation. **These eligibility constraints will be strictly enforced in order to treat everyone fairly and consistently**. In the event that an individual exceeds this limit, proposals received within the limit will be accepted based on 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.**

Additional Eligibility Info:

These awards are not intended to support investigators primarily based at overseas campuses of US institutions.

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.

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

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via the NSF FastLane system. PAPPG Chapter II.D.3 provides additional information on collaborative proposals.

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

It is expected that the EU investigators collaborating on a proposal submitted in response to this solicitation will arrange for their support directly with EU funding sources. US investigators will submit to NSF in accordance with NSF's guidelines and procedures. Evaluation of proposals to NSF will proceed independently of review of any proposal submitted to DG CONNECT or its agent.

The following information supplements the guidelines provided in the NSF Proposal and Award Policies and Procedures Guide (PAPPG):

- **Proposal Titles:** Proposals for this solicitation must have titles that begin with either 1) "ICE-T: RC:" for a *Research Collaboration,* or 2) "ICE-T: RI:" for *Research Collaboration Initiation,* or 3) "ICE-T: RF:" for a *Research Fellowship*, each followed by project-specific text.

If you submit a proposal as part of a set of collaborative proposals (i.e., multiple US institutions), the title of the proposal should be of the form "ICE-T: RC: Collaborative Proposal:", "ICE-T: RI: Collaborative Proposal:", or "ICE-T: RF: Collaborative Proposal:" followed by project-specific text .

- **Project Summary:** The Project Summary must consist of an overview, a statement on the intellectual merit of the proposed activity, and a statement on the broader impacts of the proposed activity, as indicated in the PAPPG.

Please provide between 2 and 6 sets of keywords at the end of the overview in the Project Summary. CISE personnel will use this information in implementing the merit review process. The keywords should describe the main scientific/engineering areas explored in the proposal. Keywords should be prefaced with "Keywords" followed by a colon and each keyword set should be separated by semi-colons. Keywords should be of the type used to describe research in a journal submission, and may include technical areas of expertise necessary to review the proposal. They should be included at the end of the overview in the project summary and might appear, for example, as **Keywords: AWN; advanced radio technologies; software-defined radios; vehicular communications; privacy.**

- **Project Description:** The Project Description discusses the research and education activities to be undertaken. The Project Description must identify the EU institution(s) and the geographic location(s). The Project Description is limited to 15 pages for a RC proposal, 10 pages for a RI proposal, and 10 pages for a RF proposal. **Proposals that exceed these limits will be returned without review.**

Proposers are reminded that, as specified in PAPPG Chapter II.C.2.d

- The Project Description must contain, as a separate section within the narrative, a section

labeled "Intellectual Merit" and a section labeled "Broader Impacts." **Proposals without these clearly-identifiable sections will be returned without review.**

- Results from Prior NSF Support: If any PI or co-PI identified on the proposal has received NSF funding with an end date in the past five years (including any current funding and no-cost extensions), information on the award is required for each PI and co-PI, regardless of whether the support was directly related to the proposal. In cases where the PI or co-PI has received more than one award (excluding amendments), they need only report on the one award most closely related to the proposal. Funding includes not just salary support, but any funding awarded by NSF. Please refer to the PAPPG for details about the information that must be provided and for further requirements for this section of the proposal. Note that these results from prior NSF support must include separate descriptions under two distinct headings, "Intellectual Merit" and "Broader Impacts."

Note for RF proposals: The Project Description, and budget, should indicate if a stipend will be paid to the traveling graduate student Fellow. It is not required that the prospective graduate student intended for the Fellowship be named in the RF proposal.

- **Required Supplementary Documents:** The following Supplementary Documents are required for all proposals. In the Supplementary Documents section, the lead institution should upload the following information (i.e., not part of the project description and need only be submitted by the lead institution in the case of collaborative proposals with multiple US institutions):

  - *Collaboration and Management Plan*: In a supplemental document (up to 3 pages), describe a comprehensive collaboration and management plan. Each proposal must have an EU collaborator: identify the EU institutions who will participate in the activity; identify the EU team member who will take responsibility for overall EU project coordination and management and who will serve as the contact liaison for the project; describe management and research responsibilities for the project; define the expected contributions of each PI and provide a convincing case that the collaborative contributions of the project team members will be greater than the sum of each of their individual contributions; describe mechanisms for integrating and managing all organizations and individuals involved in the project and exposing participating students or junior faculty to their counterparts in the EU; and provide a timeline for the proposed effort and identify the parties responsible for each major task.

For collaborative proposals (*i.*e., multiple US institutions), the lead institution should provide this information for all US participants. Where appropriate, the Collaboration and Management Plan might include: 1) the specific roles of the project participants in all organizations involved; 2) information on how the project will be managed across all the investigators, institutions, and/or disciplines; 3) identification of the specific coordination mechanisms that will enable cross-investigator, cross-institution, and/or cross-discipline scientific integration (e.g., yearly workshops, graduate student exchange, project meetings at conferences, use of the grid for videoconferences, software repositories, etc.); and 4) specific references to the budget line items that support collaboration and coordination mechanisms.

The length of, and degree of, detail provided in the Collaboration and Management Plan should be commensurate with the complexity of the proposed project but must be sufficient to ensure that the US and EU project elements will work together as an integrated project. *If a proposal does not include a Collaboration and Management Plan, of up to 3 pages, that proposal will be returned without review.*

  - *Letter of Collaboration* (up to 3 pages): Proposals from US investigators to NSF must identify their EU collaborators in the List of Personnel and Biographical Sketches, and submit a Letter of Collaboration from a Principal Investigator at each EU partner institution. The Letter of Collaboration should attest that at least one investigator on the EU team led by that Principal Investigator is currently receiving, or has received, support from DG CONNECT or their agent within the past 5 years. The Letter of Collaboration should also affirm that the EU team anticipates having the funding, capabilities, and facilities to support the effort described in the proposal submitted to NSF by US investigators. The Letter of Collaboration should specify that an Intellectual Property arrangement between the collaborating US and EU institutions has been established, or is expected to be established prior to the project start date. Such an agreement should satisfy the policies and practices of each Participant.

For a *Research Collaboration Initiation* proposal, the Letter of Collaboration must attest that the US and EU investigators are embarking on a new collaboration; a US investigator who has jointly participated on a past project, or has co-authored a publication in a peer-reviewed journal or conference with a named EU collaborator, is prohibited from receiving an *RI* award.

Bibliographies must include not only the references relevant to the work to be undertaken by US principal investigators but also those relevant to the work to be undertaken by their EU counterparts.

  - *Project Personnel and Partner Institutions (Note: In collaborative proposals with multiple US institutions, the lead institution should provide this information for all participants):* 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 reviewer selection. The list should include all PIs, Co-PIs, Senior Personnel, paid/unpaid Consultants or Collaborators, Subawardees, and Postdocs, spanning both US and EU personnel. 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:

- Mary Smith; XYZ University; PI
- John Jones; University of PQR; Senior Personnel
- Jane Brown; XYZ University; Postdoc
- Bob Adams; ABC Inc.; Paid Consultant
- Mary White; Welldone Institution; Unpaid Collaborator

- Tim Green; ZZZ University; Subawardee

- *Data Management Plan (required):*

Proposals must include a supplementary document of no more than two pages labeled "Data Management Plan." This supplementary document should describe how the proposal will conform to NSF policy on the dissemination and sharing of research results.

See Chapter II.C.2.j of the PAPPG for full policy implementation.

For additional information on the Dissemination and Sharing of Research Results, see: https://www.nsf.gov/bfa/dias/policy/dmp.jsp.

For specific guidance for Data Management Plans submitted to the Directorate for Computer and Information Science and Engineering (CISE) see: https://www.nsf.gov/cise/cise_dmp.jsp.

Single Copy Documents:

Collaborators and Other Affiliations Information: Proposers should follow the guidance specified in Chapter II.C.1.e of the NSF PAPPG.

Note the distinction to the list of Project Personnel and Partner Institutions specified above under Supplementary Documents: the listing of all project participants is collected by the project lead and entered as a Supplementary Document, which is then automatically included with all proposals in a project. The Collaborators and Other Affiliations are entered for each participant within each proposal and, as Single Copy Documents, are available only to NSF staff.

No other items or appendices are to be included. Full proposals containing items other than those required above or by the *Proposal and Award Policies and Procedures Guide (PAPPG)* will not be reviewed.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Budget Preparation Instructions:

Grantees of this program will be expected to attend, and should budget for, annual PI meetings for the purpose of sharing research progress with representatives of other projects funded under this solicitation as well as NSF and DG CONNECT representatives and other persons designated by NSF and DG CONNECT. The first such meeting will be held approximately 9 months after the awards are made, and succeeding meetings will be held every 12 months thereafter. Each RF and RI grantee is expected to attend at least one annual PI meeting. For budgetary purposes, proposers should assume that two of these meetings will be held in Europe and one will be held in the US.

C. Due Dates

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

    May 07, 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 *Investing in Science, Engineering, and Education for the Nation's Future: NSF Strategic Plan for 2014-2018*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

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

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

A. Merit Review Principles and Criteria

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

1. Merit Review Principles

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

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

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

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

2. Merit Review Criteria

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

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

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

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

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

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

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

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

Additional Solicitation Specific Review Criteria

In addition to the merit review principles and criteria described above, ICE-T proposals will also be evaluated by:

- The extent to which the proposed work supports the solicitation theme of "Enabling US-EU Internet Core & Edge Technologies"; and

- The extent to which the work and collaboration plans describe a unified, synergistic project between the US and EU participants.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad Hoc Review and/or Panel Review.

Once an award or declination decision has been made, the NSF Program Officer will inform DG CONNECT Program Managers of the award recommendations. Public award information will include the identities of named collaborating EU investigators, and their institutions.

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 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:

Grantees of this program will be expected to attend, and should budget for, annual PI meetings for the purpose of sharing research progress with representatives of other projects funded under this solicitation as well as NSF and DG CONNECT representatives and other persons designated by NSF and DG CONNECT. The first such meeting will be held approximately 9 months after the awards are made, and succeeding meetings will be held every 12 months thereafter. Each RF and RI grantee is expected to attend at least one annual PI meeting. For budgetary purposes, proposers should assume that two of these meetings will be held in the EU and one will be held in the US.

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:

- John "Jack" Brassil, telephone: (703) 292-8950, email: jbrassil@nsf.gov

- Monisha Ghosh, telephone: 703-292-8746, email: mghosh@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	(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
Alexandria, VA 22314

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