

Smart and Connected Communities (S&CC)

PROGRAM SOLICITATION

NSF 21-535

REPLACES DOCUMENT(S):

NSF 19-564



National Science Foundation

Directorate for Computer and Information Science and Engineering
Division of Computer and Network Systems
Division of Information and Intelligent Systems
Division of Computing and Communication Foundations

Directorate for Education and Human Resources
Research on Learning in Formal and Informal Settings

Directorate for Engineering
Division of Civil, Mechanical and Manufacturing Innovation
Division of Electrical, Communications and Cyber Systems

Directorate for Social, Behavioral and Economic Sciences
Division of Behavioral and Cognitive Sciences
Division of Social and Economic Sciences



Japan Science and Technology Agency

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

February 24, 2021

IMPORTANT INFORMATION AND REVISION NOTES

The Smart and Connected Communities (S&CC) program solicitation has been revised for the FY 2021 competition, and prospective Principal Investigators (PIs) are encouraged to read the solicitation carefully. Among the changes are the following:

- The Track 1 budget for the Integrative Research Grants (SCC-IRG) category has been revised to include budgets ranging between \$1,500,001 and \$2,500,000.
- A joint research collaboration has been added with the Japan Science and Technology (JST) Agency to support joint US-Japan IRG Track 2 proposals (SCC-IRG JST) that address topics related to recovery from the novel coronavirus 2019 (COVID-19) pandemic and future resilience planning related to pandemics and disasters.
- Proposals are being requested to form and lead a S&CC Virtual Organization.
- Language has been added to the Program Description to encourage submission of proposals that advance disruptive technologies and concepts that may involve high-risk, high-reward approaches or significantly advance theoretical foundations of S&CC sociotechnical research.
- Within the Project Description for SCC-IRG proposals, the description of the "Scope and Scale" section has been revised to more clearly articulate the intent of this section.
- Proposal deadlines have been revised.
- The requirement to submit a Letter of Intent has been removed.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 20-1), which is effective for proposals submitted, or due, on or after June 1, 2020.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Smart and Connected Communities (S&CC)

Synopsis of Program:

Communities in the United States (US) and around the world are entering a new era of transformation in which residents and their surrounding environments are increasingly connected through rapidly-changing intelligent technologies. This transformation offers great promise for improved wellbeing and prosperity but poses significant challenges at the complex intersection of technology and society. The goal of the NSF Smart and Connected Communities (S&CC) program solicitation is to accelerate the creation of the scientific and engineering foundations that will enable smart and connected communities to bring about new levels of economic opportunity and growth, safety and security, health and wellness, accessibility and inclusivity, and overall quality of life.

For the purposes of this solicitation, communities are defined as having geographically-delineated boundaries—such as towns, cities, counties, neighborhoods, community districts, rural areas, and tribal regions—consisting of various populations, with the structure and ability to engage in meaningful ways with proposed research activities. A “smart and connected community” is, in turn, defined as a community that synergistically integrates intelligent technologies with the natural and built environments, including infrastructure, to improve the social, economic, and environmental well-being of those who live, work, learn, or travel within it.

The S&CC program encourages researchers to work with community stakeholders to identify and define challenges they are facing, enabling those challenges to motivate use-inspired research questions. For this solicitation, community stakeholders may include some or all of the following: residents, neighborhood or community groups, nonprofit or philanthropic organizations, businesses, as well as municipal organizations such as libraries, museums, educational institutions, public works departments, and health and social services agencies. **The S&CC program supports integrative research that addresses fundamental technological and social science dimensions of smart and connected communities and pilots solutions together with communities.** Importantly, the program is interested in projects that consider the sustainability of the research outcomes beyond the life of the project, including the scalability and transferability of the proposed solutions.

This S&CC solicitation will support research projects in the following categories:

- **S&CC Integrative Research Grants (SCC-IRG) Tracks 1 and 2.** Awards in this category will support fundamental integrative research that addresses technological and social science dimensions of smart and connected communities and pilots solutions together with communities. Track 1 proposals may request budgets ranging between \$1,500,001 and \$2,500,000, with durations of up to four years. Track 2 proposals may request budgets up to \$1,500,000, with durations of up to three years. Note that NSF is working with the Japan Science and Technology Agency (JST) to support joint US-Japan IRG Track 2 proposals (SCC-IRG JST) that address topics related to recovery from COVID-19 and future resilience planning related to pandemics and disasters, including how the proposed research will enable community adjustment to life in the new normal of a post-COVID-19 society.
- **S&CC Planning Grants (SCC-PG).** Awards in this category are for capacity building to prepare project teams to propose future well-developed SCC-IRG proposals. Each of these awards will provide support for a period of one year and may be requested at a level not to exceed \$150,000 for the total budget.
- **S&CC Virtual Organization (SCC-VO).** Proposals are being sought to establish a Virtual Organization that will: (i) facilitate and foster interaction and exchanges among S&CC PIs and their teams, including community partners; (ii) enable sharing of artifacts and knowledge generated by S&CC projects with the broader scientific and non-academic communities (e.g., local community stakeholders as described in this solicitation); and (iii) facilitate and foster collaboration and information exchange between S&CC researchers, community stakeholders, and others. No more than one S&CC-VO proposal will be funded. Funding of up to \$250,000 per year for up to three years may be requested.

S&CC is a cross-directorate program supported by NSF's Directorates for Computer and Information Science and Engineering (CISE), Education and Human Resources (EHR), Engineering (ENG), and Social, Behavioral, and Economic Sciences (SBE).

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.

- David Corman, Program Director, CISE/CNS, telephone: (703) 292-8754, email: dcorman@nsf.gov
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- Wendy Nilsen, Program Director, CISE/IIS, telephone: (703) 292-2568, email: wnilsen@nsf.gov
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- Sara Kiesler, Program Director, SBE/SES, telephone: (703) 292-8643, email: skiesler@nsf.gov
- Ellen L. McCallie, Program Director, EHR/DRL, telephone: (703) 292-5115, email: emccalli@nsf.gov
- Yueyue Fan, Program Director, ENG/CMMI, telephone: (703) 292-4453, email: yfan@nsf.gov
- Walter G. Peacock, Program Director, ENG/CMMI, telephone: (703) 292-2634, email: wpeacock@nsf.gov
- Radhakishan Baheti, Program Director, ENG/ECCS, telephone: (703) 292-8339, email: rbaheti@nsf.gov
- Anthony Kuh, Program Director, ENG/ECCS, telephone: (703) 292-2210, email: akuh@nsf.gov
- Aranya Chakraborty, Program Director, ENG/ECCS, telephone: (703)292-8360, email: achakrab@nsf.gov

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

- 47.041 --- Engineering
- 47.070 --- Computer and Information Science and Engineering
- 47.075 --- Social Behavioral and Economic Sciences
- 47.076 --- Education and Human Resources

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant or Cooperative Agreement

Estimated Number of Awards: 20 to 30

The number of awards is dependent upon the proposals received and the degree to which proposals meet the solicitation goals, NSF merit review criteria, and solicitation-specific review criteria.

Proposers are strongly encouraged to consider the scope, scale, and budget of previous S&CC IRG awards: <https://www.nsf.gov/cise/scc>.

Anticipated Funding Amount: \$23,500,000

Subject to the quality of proposals received and availability of funds.

Eligibility Information

Who May Submit Proposals:

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG), Chapter I.E. Unaffiliated individuals are not eligible to submit proposals in response to this solicitation.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 2

An individual may appear as PI, co-PI, Senior Personnel, or Consultant on no more than two proposals submitted in response to this solicitation.

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 two proposals received prior to the deadline will be accepted and the remainder will be returned without review). This limitation includes proposals submitted by a lead organization and any subawards included as part of a collaborative proposal involving multiple institutions. **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 Research.gov: *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):

February 24, 2021

Proposal Review Information Criteria

Merit Review Criteria:

National Science Board approved criteria. Additional merit review criteria apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions:

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

Reporting Requirements:

Standard NSF reporting requirements apply.

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I. INTRODUCTION

Communities in the US and around the world are entering a new era of transformation in which residents and their surrounding environments are increasingly connected through rapidly-changing intelligent technologies. Concurrently, communities are unique and constantly evolving. Shifts in population size, demographics, economic opportunity, technology, built and natural environments, and available services all impact overall community culture, needs, and opportunities. A fundamental understanding of the complex, dynamic interactions between technology and society is essential for unlocking the potential benefits of smart and connected communities.

The goal of this solicitation is to accelerate the creation of the scientific and engineering foundations that will enable smart and connected communities to bring about new levels of economic opportunity and growth, safety and security, health and wellness, and overall quality of life.

NSF has long been a leader in supporting research and education activities and growing the partnerships that form the foundation for 21st-century smart and connected communities. Information on recent and on-going NSF S&CC efforts, including the S&CC program, can be found on NSF's *Smart & Connected Communities: A Vision for the 21st Century* webpage: <https://www.nsf.gov/cise/scc/>.

II. PROGRAM DESCRIPTION

A. Overview

For the purposes of this solicitation, communities are defined as having geographically-delineated boundaries—such as towns, cities, counties, neighborhoods, community districts, rural areas, and tribal regions—consisting of various populations, with the structure and ability to engage in meaningful ways with the proposed research activities. A “smart and connected community” is, in turn, defined as a community that synergistically integrates intelligent technologies with the natural and built environments, including infrastructure, to improve the social, economic, and environmental well-being of those who live, work, or travel within it.

The S&CC program encourages researchers to work with community stakeholders to identify and define challenges they are facing, enabling those challenges to motivate use-inspired research questions. For this solicitation, community stakeholders may include some or all of the following: residents, neighborhood or community groups, nonprofit or philanthropic organizations, businesses; as well as municipal organizations such as libraries, museums, educational institutions, public works departments, and health and social services agencies.

The specific objectives of this solicitation are to: (1) enhance scientific and engineering knowledge that integrates technological and social science dimensions through modeling, analysis, design, and in-situ experimentation in ways that improve the quality of life within communities; (2) foster the development of a multidisciplinary and diverse research community that encompasses and integrates the perspectives of scientific areas supported by, but not limited to, participating NSF directorates; (3) integrate community stakeholders into smart and connected community projects in order to co-create and pilot solutions that are directly informed by the needs, challenges, and opportunities of present and future communities; and (4) conduct robust evaluation of project outcomes.

B. Proposal Categories

(i) Research Project Proposals

Proposals for research projects in the following categories will be considered:

S&CC Integrative Research Grants (SCC-IRGs) Tracks 1 and 2. This category has two funding levels. Track 1 proposals may request budgets ranging between \$1,500,001 and \$2,500,000, with durations of up to four years. Track 2 proposals may request budgets up to \$1,500,000, with durations of up to three years.

These awards will support **integrative research that addresses fundamental technological and social science dimensions of smart and connected communities and pilots solutions together with communities.** Importantly, the program is interested in projects that consider the **sustainability of the research outcomes beyond the life of the project, including the scalability and transferability of the proposed solutions.** This includes, for example, projects that consider pursuing collaborations that link research outcomes to planned efforts within the community, identify joint investment models for implementing innovative research solutions, or consider how research will be transitioned to full-scale implementation, if successful.

S&CC research and education activities may also benefit from access to cloud computing platforms, which provide robust, agile, reliable, and scalable infrastructure. In particular, real-time data acquisition, storage, as well as tools for machine learning and data analytics could be leveraged through these platforms. Proposals may request cloud computing resources to use public clouds such as Amazon Web Services (AWS), Google Cloud Platform (GCP), Microsoft Azure, and IBM Cloud. Cloud computing resources may be obtained through CloudBank (CloudBank.org). (see Section V.3. Proposal Preparation Instructions, Supplementary Documents, for more information).

S&CC Planning Grants (SCC-PGs). Awards funded in this category will provide support for a period of one year and may be requested at a level not to exceed \$150,000 for the total budget. **PG awards should prepare project teams to submit well-developed SCC-IRG proposals near or after the conclusion of the planning grant.**

These awards will support a range of planning activities intended to, for example, foster the research to effectively integrate multiple disciplinary perspectives; explore community contexts and build collaborations with relevant stakeholders; and hone research gaps, questions, and hypotheses. Activities within scope include, but are not limited to, travel, multidisciplinary workshops, stakeholder meetings, data collection, preliminary experiments, and pilots.

(ii) S&CC Virtual Organization (S&CC-VO) Proposals

Proposals are sought to establish a S&CC Virtual Organization (S&CC-VO). S&CC-VO proposals should describe innovative and effective strategies and mechanisms to: (i) facilitate and foster interaction and exchanges among S&CC PIs and their teams, including community partners; (ii) enable sharing of artifacts and knowledge generated by S&CC projects with the broader scientific and non-academic communities (e.g., local community stakeholders as described in this solicitation); and (iii) facilitate and foster collaboration and information exchange between S&CC researchers, community stakeholders, and others. Strategies and mechanisms could include, but are not limited to:

- Creating and maintaining a web-based repository and collaborative platform to facilitate the open exchange of research results, tools, and educational materials among S&CC researchers and the broader community;
- Hosting tutorials and workshops to promote community interest, understanding, and the use of new methods;
- Identifying effective mechanisms for technology transfer and procurement by communities;
- Creating a consortium of non-profit organizations as well as small businesses with interests in smart-and-connected-communities innovations;
- Creating opportunities for matchmaking between communities and researchers to work together to address pressing community needs related to smart and connected communities; and
- Collecting and disseminating smart-and-connected-communities challenge problems from communities.

No more than one S&CC-VO proposal will be funded. Funding of up to \$250,000 per year for up to three years may be requested. The S&CC-VO will be funded as a continuing grant, with an annual review.

C. Joint Research Collaboration with the Japan Science and Technology Agency (JST)

Continuing a joint effort between JST and the S&CC program—through which a series of Planning Grants were co-funded in FY 2020—the **current solicitation will accept joint US-Japan IRG Track 2 proposals that address IRG objectives in the context of topics related to recovery from COVID-19 and future resilience planning related to pandemics and disasters. SCC-IRG JST proposals must follow the same proposal preparation instructions as for the other SCC-IRG proposals, with a few changes or additional components noted here, and described further in Sections II.D.3 and V. below.**

Although all forms of disasters that are relevant to both the US and Japan are in scope, proposing teams are encouraged to focus on recovery and resilience planning related to the continuing COVID-19 crisis. Specific topics may include, for example, how the proposed research will enable community adjustment to life in the new normal of a post-COVID-19 society, resilience and emergency management planning for future pandemics, and the compound problem of other

disasters occurring in the context of a pandemic. Researchers, working together with community partners, may wish to leverage experiences or current challenges introduced by COVID-19 to pursue associated community-level solutions. As noted above, research on resilience or emergency management planning for other forms of disasters is also welcome if relevant to both countries.

The Project Description must provide a detailed vision of a well-integrated approach across the US and Japanese components. **It must clearly describe how the international collaborative project will enable research activities, research outcomes, and impact on communities in the US and Japan that go beyond what each country's teams could accomplish on their own.** Projects must provide further detail on specific collaborative activities as well as how the project responsibilities will be divided among the US-Japan team.

The total budget for the combined US-Japan team is not to exceed \$1,500,000, with the individual budgets for the US team and Japanese team not to exceed \$750,000 each. Proposals selected for an award will be co-funded by NSF and JST as continuing grants with incremental funding over three years; NSF will provide funds directly to the US team, and JST will provide funds directly to the Japanese collaborators. NSF and JST expect to jointly fund three proposals.

In addition to the proposal submission to NSF, the Japanese research team is required to submit a separate proposal to JST through "e-Rad" (<https://www.e-rad.go.jp/en/index.html>). The deadline for the "e-Rad" submission: 19:00 (Japan Standard Time) February 24, 2021. Specific guidelines regarding this proposal to be submitted to JST is available from the JST website: https://www.jst.go.jp/inter/english/program_e/announce_e/announce_us_NSF2020_e.html

D. Project Description Components

The five components described below are required for IRG proposals, and the first two components are required for PG proposals.

1. Integrative Research

Projects must address both the technological and social science dimensions of smart and connected communities and describe how the dimensions are integrated together. Proposals should engage the multidisciplinary perspectives of scientific areas supported by participating NSF directorates. Integrative research may address a range of application domains including, but not limited to, the following: agriculture, civil infrastructure, disaster mitigation and response, energy, environmental quality, learning environments, health and wellness including healthcare, human services, accessibility and inclusivity, workforce development, resiliency, safety, social services, telecommunications, transportation and mobility, urban and rural planning, and water resources.

In this round, we also encourage submission of proposals that advance disruptive technologies and concepts that may involve high-risk, high-reward approaches or significantly advance theoretical foundations of S&CC sociotechnical research. In either case, the proposal must span social and technical dimensions with community engagement.

Technological dimensions include, but are not limited to, the following: (1) data integration and management, and computing and network resource management; (2) new algorithms and modeling frameworks for understanding and exploiting high volumes of diverse and complex infrastructure- and community-related data; (3) systems engineering approaches for integrating cyber, physical, and social concerns in a large-scale system-of-systems context with multiple stakeholders; (4) ubiquitous and persistent connectivity to enable data collection and instantaneous dissemination of information; (5) improved cybersecurity and privacy; (6) innovations in integrating materials, sensors, structures, and systems to support smart and connected communities; (7) design of interfaces, controls, and feedback systems; and (8) innovative concepts for advanced infrastructure systems and services, including dual-use sensing and flexible infrastructure that supports multiple uses and applications.

Social science dimensions include, but are not limited to, the following: (1) innovations facilitated by intelligent technologies and focused on community behavioral or social change experiments and/or STEM teaching and learning; (2) studies of learning or collaboration processes within and across communities, including STEM education research; (3) data describing long-term responses of communities to existing or predicted adversities or disasters; (4) improved empirical methods for measuring and predicting community opportunities and challenges; (5) innovations in the evaluation of community interventions; and (6) evidence of institutional and social responses to technological change within communities.

Technological and social science dimensions should be explored in concert as they impact one another in the short, medium, and long terms. Examples of such projects are provided below (note that these examples are not meant to be exhaustive):

- o Collection, analysis, and use of data and information from multiple heterogeneous sources to support existing communities in identifying economically viable and sustainable options to improve quality of life;
- o Real-time adaptation of systems and infrastructures in response to changing needs and behaviors of the community by harnessing and autonomously handling data;
- o Innovative concepts for flexible services and infrastructures that are responsive to community evolution, while sustaining diversity within communities as well as its ecosystem services;
- o Prediction, analysis, and mitigation of physical, cultural, socio-economic, legal, institutional, and ethical challenges to smart and connected communities, including unintended or indirect consequences of new technologies, forms of data, and infrastructures;
- o Assessment of the role of emerging technologies in enhancing workforce and learning opportunities, such as tools to shape human-technology partnerships; development, adaptation, and/or evaluation of STEM teaching and learning efforts and resources; improvements in career longevity and job satisfaction, workforce capacity, and performance; and facilitation of lifelong learning, including of new skills and perspectives related to smart and connected communities;
- o Innovative approaches, infrastructure, and/or STEM educational research that supports a significantly more equitable and inclusive distribution of new technology opportunities and resources;
- o Novel methodologies, algorithms, and representations to enable human-centered design and engineering of capabilities, services, infrastructures, and other systems that are seamlessly integrated into the fabric of smart and connected communities;
- o New technologies and practices to improve decision making under uncertainty, including to evaluate and mitigate risks, associated with highly complex systems (spanning technologies, infrastructures, and the community) over the short-, medium-, and long-term; and
- o Advances in computational science, neuroscience, and psychometrics; theories of the brain, emotion, learning, and societal forces that will advance cyberlearning; distributed intelligence; knowledge-building communities; formal or informal educational environments; knowledge management; and communities of practice for a diverse and innovative workforce.

2. Community Engagement

Proposals should clearly identify and define the community and participating community stakeholders, and also describe activities that reflect meaningful community engagement. This engagement should consider community stakeholders as integral to the research. Investigators and community stakeholders are encouraged to work closely to develop, pilot, and evaluate creative approaches to accomplish the goals of the proposed research. Consider involving as a community stakeholder, a decision maker who has the potential to act on the results of the research. Community

stakeholders are encouraged to have leadership roles within the proposing team, including as a PI or co-PI if appropriate for the project, and are encouraged to be active participants in the project and proposal formulation.

Community stakeholders may include some or all of the following: residents, neighborhood or community groups, nonprofit or philanthropic organizations, businesses, as well as municipal organizations such as libraries, museums, public works departments, educational institutions, and health and social services agencies. In addition, community stakeholder engagement may leverage partnerships with regional stakeholders, including local, county, and state governments and departments as well as regional cooperative initiatives. **PIs are also encouraged to work with existing stakeholder groups in the community or through academic institutions with existing community initiatives.**

Examples of community engagement activities include but are not limited to the following:

- o Conceiving of and supporting research demonstrations, experimentation, proofs of concept, or pilot activities;
- o Participating in “living labs” where technological, and social advances, and educational research are staged iteratively through pilot studies in communities;
- o Helping to define or create metrics and support data collection and/or interpretation within the community context;
- o Public participation and engagement in data collection, including through crowdsourcing and community science;
- o Holding roundtables, community meetings, or conducting surveys to understand community member needs and concerns, and to develop and refine the research; and
- o Providing data, facilities, resources, and expertise instrumental to the project;

Note that the nature of the community engagement will vary based on proposal category. For SCC-PG proposals, community engagement should be integral to planning and establishing research direction-setting, whereas for SCC-IRG proposals, the community engagement is expected to be more substantive.

3. Management Plan

Researchers from diverse fields, and community stakeholders, are expected to work collaboratively and interdependently, creating shared visions, models, methods, and discoveries. Each IRG proposal must contain a Management Plan that describes the specific roles and responsibilities of the collaborating PI, co-PIs, other Senior Personnel, paid consultants, and stakeholder participants. It must also describe the expertise of the team to address the technical and social sciences dimensions of the project, and to work with the selected communities.

The plan must also address how the project will be managed across disciplines, institutions, and community entities, and should identify specific collaboration mechanisms that will enable cross-discipline and cross-sector integration of teams. The plan must also describe how tasks will be integrated over the course of the project, and provide a timeline with principal tasks and associated interactions.

Additionally, joint US-Japan SCC-IRG JST proposals must include the following:

- o Project personnel and partner institutions of both the US and Japanese participants;
- o A clear description of who is responsible for specific activities, detailing the contributions of the entire research team of US and Japanese participants; and
- o The collaboration approach for the international US-Japan activities, in addition to the approach for the US side.

4. Evaluation Plan

The Evaluation Plan should be specific to the IRG proposal's goals and milestones and describe how progress will be iteratively improved and evaluated. For example, describe criteria, metrics, and methods for assessing progress and outcomes, appropriate to the proposal. Evaluation may employ any of a variety of systematic methods: qualitative and/or quantitative methods, public participation in data collection, periodic and/or longitudinal analyses, experiments, or other approaches required to iteratively improve and successfully evaluate the project. Proposals should anticipate providing Institutional Review Boards (IRB)/Institutional Animal Care and Use Committees (IACUC) approvals as appropriate prior to award.

5. Scope and Scale

This section should **provide insight into the design of the research activities for the IRG proposal**, specifically addressing: 1) why the research outcomes can be achieved only with the selected scope and scale, and 2) how the proposed activities are commensurate with the proposed budget. Note that **this section should not duplicate the content in the Budget and Budget Justification section**. In designing the appropriate scope and scale for their projects, proposers are strongly encouraged to consider: i) the transferability and scalability of the proposed solutions to other communities, and ii) the population size that will be **directly affected by the specific proposed project**. Proposers may want to specifically address, among other areas, why the project requires the specified: 1) number and needs of community stakeholder participants, 2) timing and length of research activities, and 3) number of research collaborators and students. Proposers are further encouraged to consider the scope, scale, and associated budget of previous S&CC IRG awards: <https://www.nsf.gov/cise/scc/>.

E. Principal Investigator Meetings

In order to (a) accelerate the rate of dissemination of ideas among researchers and community stakeholders; (b) build an intellectual research core to address the challenges of smart and connected communities; and (c) enable enhanced research collaborations, the S&CC program plans to host PI meetings every year with participation from all funded projects and other representatives from academia, industry, government, and community organizations. PIs or their designees must participate in the entirety of each PI meeting throughout the duration of their awards. Lead investigators from each subaward institution and community stakeholders are expected to participate. A substitute project representative may be designated to attend a PI meeting, but only with prior approval from a cognizant NSF Program Officer. As noted in Section V.B, Budget Preparation Instructions, budgets for all projects must include funding for one or more designated S&CC project representatives (PI/co-PI/Senior Personnel or NSF-approved replacement) to attend each S&CC PI meeting during the proposed lifetime of the award. It is also strongly encouraged for at least one community stakeholder to attend the PI meeting and for the budget to include funding to support the participation of the attending stakeholder(s).

F. Other Opportunities

Within NSF, teams may want to consider related programs described on the following webpages: <https://www.nsf.gov/cise/scc/> or <https://www.nsf.gov/ere/ereweb/urbansystems/>.

Additionally, [The Federal Smart Cities and Communities Task Force](#) created the “*Federal Smart Cities and Communities Programs Resource Guide*” and “*Connecting and Securing Communities: A Guide for Federal Agencies Supporting Research, Development, Demonstration, and Deployment of Technology for*

Smart Cities and Communities” to facilitate collaboration and coordination among Smart Cities and Communities Task Force member agencies, academia, industry, local cities and communities, and other government entities. Both resources describe Federally-funded research and development (R&D) programs in smart cities and communities. These R&D programs seek to embed new digital technologies into city/community infrastructure, systems, and services.

III. AWARD INFORMATION

Anticipated Type of Award: Standard Grant or Cooperative Agreement or Continuing Grant

Estimated Number of Awards: 20 to 30

The number of awards is dependent upon the proposals received and the degree to which proposals meet the solicitation goals, NSF merit review criteria, and solicitation-specific review criteria.

Proposers are strongly encouraged to consider the scope, scale, and budget of previous S&CC IRG awards: <https://www.nsf.gov/cise/scc>.

Anticipated Funding Amount: \$23.5M

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds and quality of proposals received.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG), Chapter I.E. Unaffiliated individuals are not eligible to submit proposals in response to this solicitation.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 2

An individual may appear as PI, co-PI, Senior Personnel, or Consultant on no more than two proposals submitted in response to this solicitation.

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 two proposals received prior to the deadline will be accepted and the remainder will be returned without review). This limitation includes proposals submitted by a lead organization and any subawards included as part of a collaborative proposal involving multiple institutions. **No exceptions will be made.**

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 FastLane, Research.gov, or Grants.gov.

- 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) 292-8134 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 Research.gov: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal and Award Policies and 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) 292-8134 or by e-mail from nsfpubs@nsf.gov. The Prepare New Proposal setup will prompt you for the program solicitation number.
- 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) 292-8134 or by e-mail from nsfpubs@nsf.gov.

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

It is strongly encouraged that research teams submitting to NSF for the first time review the [Prospective New Awardee Guidelines](#) and consider submitting their proposals well in advance of the submission deadline.

The following information supplements the guidelines and requirements in the NSF PAPPG and NSF Grants.gov Application Guide:

For **joint US-Japan SCC-IRG proposals** submitted in response to Section II.C above, it is expected that the Japanese participants taking part in the joint research project will submit proposals separately to JST in accordance with JST's guidelines and procedures. US researchers will submit to NSF in accordance with NSF's guidelines and procedures.

Multi-Institutional Proposals: For collaborative proposals involving multiple institutions, the proposal must be submitted by one lead institution with funding for all other **participating institutions made through subawards**. See PAPPG Chapter II.D.3.a for additional information. **Proposals submitted as separately submitted collaborative proposals (as described under PAPPG Chapter II.D.3.b) will be returned without review.**

Cover Sheet:

Proposal Title: The title of the proposal **must** begin with **"SCC-IRG Track 1", "SCC-IRG Track 2", "SCC-PG", "SCC-IRG JST", or "SCC-VO", depending on the proposal category and type.**

The rest of the title of the proposal should describe the project in concise, informative language so that a scientifically- or technically-literate reader can understand what the project is about. The title should emphasize the scientific work to be undertaken, and be suitable for use in public press.

Project Description:

Project Descriptions for SCC-IRG and SCC-VO proposals are limited to 15 pages in length and SCC-PG proposals are limited to 5 pages in length. SCC-IRG and SCC-VO proposals exceeding 15 pages in length or SCC-PG proposals exceeding 5 pages in length will be returned without review.

All proposal categories—SCC-IRGs, SCC-PGs, and SCC-VO—must include all sections required by the PAPPG, including Broader Impacts and Results from Prior NSF Support.

Proposals also require the following components:

SCC-IRG Proposals (15 page limit): The Project Description must provide details on an integrative research approach and describe how the community engagement components infuse and support the proposed research. It must include separate sections labeled Integrative Research, Community Engagement, Management Plan, Evaluation Plan, and Scope and Scale, as described in the Program Description above and briefly summarized in the list below. A subsections labeled Research Questions must be included as part of the Integrative Research section. Additionally, a section labeled Broader Impacts must be included, as described in the PAPPG. **Proposals lacking one or more of these sections or subsections will be returned without review.**

- **Integrative Research** must be the **central focus of the Project Description**. It must describe the challenges that drive the fundamental, scientific research problems; the technical and social science approach and rationale; and the potential for transferability and scalability.
 - **Research Questions** must detail specific technological and social science research questions, hypotheses, and research gaps that underlie the proposed project and address basic, foundational research;
- **Community Engagement** must define the community, explain the rationale and breadth of community engagement and integration into the project, and describe how this engagement will be sustained throughout the duration of the award;
- **Management Plan** must describe how the expertise of each PI or co-PI will enable the project team to address the technical and social sciences research dimensions of the project and work with the selected communities, and how the project tasks will be managed and integrated;
- **Evaluation Plan** must describe the vision of success for the proposal—specifically addressing the project goals, the definition of a successful outcome, and metrics for evaluating success; and
- **Scope and Scale** must describe why the proposed research outcomes can be achieved only within the proposed scope and scale of work and how the proposed activities are commensurate with the proposed budget.
- **Broader Impacts** must include the content described in the PAPPG.

SCC-PG Proposals (5 page limit): PG proposals should prepare project teams to propose future well-developed SCC-IRG proposals. It is expected that the research concepts and community engagement will be less developed for these proposals. The Project Description must include separate sections labeled Integrative Research and Community Engagement as described in the Program Description above and briefly summarized in the list below. A subsections labeled Research Questions must be included as part of the Integrative Research section. Additionally, a section labeled Broader Impacts must be included, as described in the PAPPG. **Proposals lacking one or more of these sections or subsections will be returned without review.**

- **Integrative Research** must be the **central focus of the Project Description**. It must outline the technical and social science concepts and planning activities, including potential for transferability and scalability;
 - **Research Questions** must detail technological and social science research questions, hypotheses and research gaps that will be explored during the planning period of the proposed project and address basic, foundational research;
- **Community Engagement** must describe the community stakeholders, and detail how the academic team will work together with these stakeholders to identify the research priorities and build progress toward a future research project. Details of past collaborations should also be included, if relevant.
- **Broader Impacts** must include the content described in the PAPPG.

SCC-VO Proposals (15 page limit): Proposals should focus on the content described in Section II.B(ii) and must also include all components listed in the PAPPG.

Supplementary Documents:

1. 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 reviewer selection. The list must include all PIs, co-PIs, Senior Personnel, paid/unpaid Consultants or Collaborators, Subawardees, Postdocs, and project-level advisory committee members. 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:

- Keisha Johnson; XYZ University; PI
- Neil Gupta; University of PQR; Senior Personnel
- Xavier Brown; XYZ University; Postdoc
- Marc Garcia; ABC Inc.; Paid Consultant
- Bob Adams; HHH Community organization, Paid Consultant
- Maria White; XYX Govt organization; Unpaid Collaborator
- Lucy Wang; ZZZ University; Subawardee

Proposals that do not contain Project Personnel and Partner Institutions with the appropriate information will be returned without review.

2. Letters of Collaboration: For all substantial collaborations and engagements (included or not included in the budget) with partner institutions including communities described in the Project Description, Letters of Collaboration are strongly encouraged. These should be provided in the Supplementary Documents section of the proposal and follow the format instructions specified in the NSF PAPPG. **Letters of Collaboration should not contain endorsements or evaluation of the proposed project.** One format for a letter of collaboration is as follows:

"If the proposal submitted by Dr. [insert the full name of the Principal Investigator] entitled [insert the proposal title] is selected for funding by NSF, it is my intent to collaborate and/or commit resources as detailed in the Project Description or the Facilities, Equipment or Other Resources section of the proposal."

Collaborative activities that are identified in the budget should follow the instructions in the NSF PAPPG. Any substantial collaboration with individuals not included in the budget should also be described in the Facilities, Equipment and Other Resources section of the proposal and documented in a Letter of Collaboration from each collaborator.

3. Cloud Computing Resources: SCC-IRG proposals requesting cloud computing access through CloudBank.org (as described in Section II.B) must include a description of the request that is not to exceed two pages, and must include: (a) title of the proposal; (b) anticipated annual and total costs for accessing the desired cloud computing resources; (c) which public cloud providers will be used; and (d) a technical description of, and justification for, the requested cloud computing resources, along with how the cost was estimated. The NSF Budget should not include any costs for accessing public cloud computing resources via CloudBank.org. **Note that the total cost of the project, including this cloud computing resource request from CloudBank.org, may not exceed the budget limit described in this solicitation.** Proposers may contact CloudBank.org (see <https://www.cloudbank.org/faq>) for consultation on determining the budget estimate for using cloud computing resources.

Furthermore, **proposals requesting Cloud Computing Resources should include "CloudAccess" (one word without space) on the Project Summary page at the end of the Overview section** (before the section on Intellectual Merit).

4. JST IRG Proposals: SCC-IRG JST proposals must additionally include the following as separate Supplementary Documents:

- A copy of the proposal submitted to JST, translated into English;
- Biographical sketches for Japanese participants; and
- Written consent from the PIs acknowledging that the proposals and unattributed reviews will be shared with the partner agency, JST, for the purpose of merit review. This consent should be in the form of a signed letter from the PI and state, "I confirm on behalf of [insert name of US institution] that proposals and unattributed reviews will be shared with JST."

Additional information for SCC-IRG JST proposals is as follows:

- Submission of Current and Pending Support information is not required for Japanese participants;
- In the supplementary document labeled Project Personnel and Partner Institutions, Japanese participants should be listed as "collaborator (Japanese PI)" or "collaborators (Japanese collaborators)"; they should NOT be listed as PI, co-PI, or senior personnel and should NOT be included on the NSF cover sheet; and
- For projects involving human subjects/participants, proposers should consult both NSF and JST policies.

Single Copy Documents:

Collaborators and Other Affiliations Information:

Proposers should follow the guidance specified in Chapter II.C.1.e of the NSF PAPPG. Grants.gov Users: The COA information must be provided through use of the COA template and uploaded as a PDF attachment.

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. The Collaborators and Other Affiliations are entered for each senior project personnel and, as Single Copy Documents, are available only to NSF staff.

S&CC Proposal Preparation Checklist:

The following checklist is provided as a reminder of several key items that should be checked before submitting a proposal to this solicitation. This checklist is a summary of the requirements described above and **is not a comprehensive list**. For the items marked with (RWR), the proposal will be returned without review if the required item is not compliant at the submission deadline.

- Proposal titles should begin with "SCC-IRG Track 1", "SCC-IRG Track 2", "SCC-PG", "SCC-IRG JST" or "SCC-VO".
- (RWR) Project Description must not exceed 15 pages for SCC-IRG and SCC-VO proposals and 5 pages for SCC-PG proposals.
- (RWR) **Proposals submitted as separately submitted collaborative proposals (as described under PAPPG Chapter II.D.3.b) will be returned without review.**
- (RWR) An individual may appear as PI, co-PI, Senior Personnel, or Consultant on no more than two proposals submitted in response to this solicitation.
- Letters of Collaboration are permitted as Supplementary Documents.
- SCC-IRG JST proposals should have a total budget for the combined US-Japan team not to exceed \$1,500,000, with the individual budgets for each of the US team and Japanese team not to exceed \$750,000.
- For SCC-IRG proposals requesting Cloud resources: **the total cost of the project, including this cloud computing resource request from**

CloudBank.org, may not exceed the budget limit described in this solicitation.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Budget Preparation Instructions:

Budgets for all projects must include funding for one or more designated S&CC project representatives (PI/co-PI/Senior Personnel or NSF-approved replacement) to attend annual S&CC PI meetings during the proposed lifetime of the award and are encouraged to include funding for attendance of one community stakeholder (see Section II of this program solicitation). It is also encouraged to consider including funding for community stakeholder participation in the project as part of the project budget, or explain why this does not make sense or is not possible.

C. Due Dates

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

February 24, 2021

D. FastLane/Research.gov/Grants.gov Requirements

For Proposals Submitted Via FastLane or Research.gov:

To prepare and submit a proposal via FastLane, see detailed technical instructions available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. To prepare and submit a proposal via Research.gov, see detailed technical instructions available at: https://www.research.gov/research-portal/appmanager/base/desktop?_nfpb=true&_pageLabel=research_node_display&_nodePath=/researchGov/Service/Desktop/ProposalPreparationandSubmission.html. For FastLane or Research.gov user support, call the FastLane and Research.gov Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov or rgov@nsf.gov. The FastLane and Research.gov Help Desk answers general technical questions related to the use of the FastLane and Research.gov systems. 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: <https://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 or Research.gov may use Research.gov to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements, for review. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF either as *ad hoc* reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in PAPPG Exhibit III-1.

A comprehensive description of the Foundation's merit review process is available on the NSF website at: https://www.nsf.gov/bfa/dias/policy/merit_review/.

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

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

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

A. Merit Review Principles and Criteria

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

1. Merit Review Principles

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

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

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

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

2. Merit Review Criteria

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

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

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

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

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

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

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

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

Additional Solicitation Specific Review Criteria

For SCC-IRG proposals: How effectively does the proposal address integrative research, community engagement, project management, evaluation, and scope and scale?

For SCC-PG proposals: how effectively does the proposal address integrative research and community engagement?

For SCC-IRG JST proposals, in addition to the criteria for the other IRG proposals, will the combined team of US and Japanese researchers enable research activities, outcomes, and impact on communities in the US and Japan that go beyond what each country's teams could accomplish on their own?

B. Review and Selection Process

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

For joint US-Japan IRG proposals, proposals will be reviewed by NSF panels using the same criteria as for the other IRG proposals, including adhering to standard review criteria for intellectual merit and broader impacts. NSF will invite a set of JST-suggested reviewers to participate as panelists for the JST-specific panels. Funding recommendations will be made jointly by NSF and JST program directors.

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) 292-8134 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:

For every S&CC award, one or more designated project representatives (PI/co-PI/Senior Personnel or NSF-approved replacement) must attend annual S&CC

PI meetings throughout the duration of the grant.

As a condition of every S&CC award, the grantee agrees to submit requested project data for the purpose of program evaluation to an NSF third-party evaluator.

Attribution of support in publications must acknowledge the National Science Foundation, the award number, and the program, by including the phrase, "as part of the NSF Smart & Connected Communities Program."

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:

- David Corman, Program Director, CISE/CNS, telephone: (703) 292-8754, email: dcorman@nsf.gov
- Linda Bushnell, Program Director, CISE/CNS, telephone: (703) 292-8950, email: lbushnel@nsf.gov
- Sandip Roy, Program Director, CISE/CNS, telephone: (703) 292-8950, email: saroy@nsf.gov
- Michal Ziv-El, Associate Program Director, CISE/CNS, telephone: (703) 292-4926, email: mzivel@nsf.gov
- Wendy Nilsen, Program Director, CISE/IIS, telephone: (703) 292-2568, email: wnilsen@nsf.gov
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- Walter G. Peacock, Program Director, ENG/CMMI, telephone: (703) 292-2634, email: wpeacock@nsf.gov
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- Anthony Kuh, Program Director, ENG/ECCS, telephone: (703) 292-2210, email: akuh@nsf.gov
- Aranya Chakraborty, Program Director, ENG/ECCS, telephone: (703)292-8360, email: achakrab@nsf.gov

For questions related to the use of FastLane or Research.gov, contact:

- FastLane and Research.gov Help Desk: 1-800-673-6188
- FastLane Help Desk e-mail: fastlane@nsf.gov.
- Research.gov Help Desk e-mail: rgov@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 <https://www.grants.gov>.

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- **Location:** 2415 Eisenhower Avenue, Alexandria, VA 22314
- **For General Information** (NSF Information Center): (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**
 - Send an e-mail to: nsfpubs@nsf.gov
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- **To Locate NSF Employees:** (703) 292-5111


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

committee members. See [System of Record Notices](#), NSF-50, "Principal Investigator/Proposal File and Associated Records," and NSF-51, "Reviewer/Proposal File and Associated Records." Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

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