# Sustainability Research Networks Competition (SRN)

## PROGRAM SOLICITATION
### NSF 11-574

**National Science Foundation**

Directorate for Engineering

Directorate for Biological Sciences

Directorate for Computer & Information Science & Engineering

Directorate for Education & Human Resources

Directorate for Geosciences
Division of Polar Programs

Directorate for Mathematical & Physical Sciences

Directorate for Social, Behavioral & Economic Sciences

Office of International and Integrative Activities

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

December 01, 2011

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

April 01, 2012

## IMPORTANT INFORMATION AND REVISION NOTES

**A revised version of the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG), NSF 13-1, was issued on October 4, 2012 and is effective for proposals submitted, or due, on or after January 14, 2013. Please be advised that the guidelines contained in NSF 13-1 apply to proposals submitted in response to this funding opportunity.**

Please be aware that significant changes have been made to the PAPPG to implement revised merit review criteria based on the National Science Board (NSB) report, National Science Foundation's Merit Review Criteria: Review and Revisions. While the two merit review criteria remain unchanged (Intellectual Merit and Broader Impacts), guidance has been provided to clarify and improve the function of the criteria. Changes will affect the project summary and project description sections of proposals. Annual and final reports also will be affected.

A by-chapter summary of this and other significant changes is provided at the beginning of both the *Grant Proposal Guide* and the *Award & Administration Guide*.

*Please note that this program solicitation may contain supplemental proposal preparation guidance and/or guidance that deviates from the guidelines established in the Grant Proposal Guide.*

A revised version of the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG), NSF 11-1, was issued on October 1, 2010 and is effective for proposals submitted, or due, on or after January 18, 2011. Please be advised that the guidelines contained in NSF 11-1 apply to proposals submitted in response to this funding opportunity.

**Cost Sharing:** The PAPPG has been revised to implement the National Science Board's recommendations regarding cost sharing. Inclusion of voluntary committed cost sharing is prohibited. In order to assess the scope of the project, all organizational resources necessary for the project must be described in the Facilities, Equipment and Other Resources section of the proposal. The description should be narrative in nature and must not include any quantifiable financial information. Mandatory cost sharing will only be required when explicitly authorized by the NSF Director. See the PAPP Guide Part I: *Grant Proposal Guide (GPG)* Chapter II.C.2.g(xi) for further information about the implementation of these recommendations.

**Data Management Plan:** The PAPPG contains a clarification of NSF's long standing data policy. All proposals must describe plans for data management and sharing of the products of research, or assert the absence of the need for such plans. FastLane will not permit submission of a proposal that is missing a Data Management Plan. The Data Management Plan will be reviewed as part of the intellectual merit or broader impacts of the proposal, or both, as appropriate. Links to data management requirements and plans relevant to specific Directorates, Offices, Divisions, Programs, or other NSF units are available on the NSF website at: http://www.nsf.gov/bfa/dias/policy/dmp.jsp. See Chapter II.C.2.j of the GPG for further information about the implementation of this requirement.

**Postdoctoral Researcher Mentoring Plan:** As a reminder, each proposal that requests funding to support postdoctoral researchers must include, as a supplementary document, a description of the mentoring activities that will be provided for such individuals. Please be advised that if required, FastLane will not permit submission of a proposal that is missing a Postdoctoral Researcher Mentoring Plan. See Chapter II.C.2.j of the GPG for further information about the implementation of this requirement.

This solicitation specifies that only one proposal may be submitted for a project. If multiple organizations are participating in the project, support for secondary organizations must be made via subawards from the lead organization. Of the two types of collaborative proposal formats described in the *Grant Proposal Guide*, this solicitation allows only a single proposal submission with subawards administered by that lead organization.

This solicitation identifies a template to be used for letters of collaboration from other organizations and individuals.

## SUMMARY OF PROGRAM REQUIREMENTS

### General Information

**Program Title:**

Sustainability Research Networks Competition (SRN)

**Synopsis of Program:**

Sustainability Research Networks will engage and explore fundamental theoretical issues and empirical questions in sustainability science, engineering, and education that will increase our understanding of the ultimate sustainability challenge - maintaining and improving the quality of life for the nation within a healthy Earth system. The goal of the Sustainability Research Networks (SRN) competition is to support the development and coalescence of entities to advance collaborative research that addresses questions and challenges in sustainability science, engineering, and education. SRNs will link scientists, engineers, and educators, at existing institutions, centers, networks, and also develop new research efforts and collaborations.

Each SRN network will be built upon an ambitious and nationally important sustainability theme. Proposers will be tasked with choosing a specific theme for their network, identifying the research already being done in this area, proposing methods for linking existing research efforts, and then proposing research needed to advance their specific research theme. Examples of possible SRN themes are provided in the "Program Description" section of this solicitation (Section II.B.). SRNs will foster new knowledge and tools at a frontier of research that significantly crosses and melds the boundaries of diverse disciplines, and creates the integrated science and engineering disciplines of the future. SRNs will pursue new opportunities in science, engineering and educational research that truly require the scale, scope, and facilities enabled by such a network.

The Sustainability Research Networks competition outlined here is one part of the growing NSF investment in its Science, Engineering and Education for Sustainability (SEES) portfolio (www.nsf.gov/sees/). Challenges associated with broadly based SEES goals will be met by supporting fundamental science and engineering research and education needed to understand and overcome the barriers to sustainable human well being and to forge reasoned pathways to a sustainable future. NSF, in partnership with other agencies, international efforts, and the private sector, aims to support members of the academic research community for projects which produce discoveries and knowledge that will inform decisions leading to environmental, energy, social and cultural sustainability. NSF support will advance the frontiers of conceptual, empirical and computational research in science, engineering and education so that the nation has the knowledge base to inform policies on sustainability.

Proposed SRNs are expected to be multi-dimensional with regard to "disciplines" and address fundamental issues that are likely to yield significant new understanding and knowledge.

**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.*

- Sarah L. Ruth, telephone: (703) 292-8521, email: srn@nsf.gov
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- Alan J. Tessier, telephone: (703) 292-8481, email: srn@nsf.gov
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**Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):**

- 47.041 --- Engineering
- 47.049 --- Mathematical and Physical Sciences
- 47.050 --- Geosciences
- 47.070 --- Computer and Information Science and Engineering
- 47.074 --- Biological Sciences
- 47.075 --- Social Behavioral and Economic Sciences
- 47.076 --- Education and Human Resources
- 47.079 --- International and Integrative Activities (IIA)
- 47.081 --- Office of Experimental Program to Stimulate Competitive Research

### Award Information

**Anticipated Type of Award:** Cooperative Agreement

**Estimated Number of Awards:** 3 to 4 SRNs, pending quality of proposals submitted and availability of funds.

**Anticipated Funding Amount:** $36,000,000 pending availability of funds. **SRN awards are expected to be 4 to 5 years in duration and budgets must not exceed $12,000,000 total per award.** The budget request must be consistent with the scope of the SRN network proposed. ***Proposers are discouraged from asking for the maximum annual budget amount, unless the proposal outlines network activities that are consistent with this scope.***

## Eligibility Information

**Organization Limit:**

Proposals may only be submitted by the following:

- Preliminary proposals and invited full proposals may be submitted by U.S. academic institutions accredited in, and having a campus located in the U.S., that have research and degree-granting education programs in any area of research supported by NSF. The lead institution is expected to develop partnerships or arrangements with other universities/colleges, or other institutions such as national laboratories; research museums; private sector; state, local, and tribal governments; non-governmental organizations; and international collaborators, as appropriate, to enable the SRN to attain its strategic goals.

**PI Limit:**

None Specified

**Limit on Number of Proposals per Organization:** 3

A single organization may submit a maximum of three preliminary proposals as the lead institution. Full proposals are to be submitted only when invited by NSF. There is no limit to participation as a partner institution. It is not likely that the SRN program will provide support for more than one SRN from any one lead institution in this competition.

**Limit on Number of Proposals per PI:** 1

An individual may appear as Lead Principal Investigator (PI) on only **one** SRN proposal submitted in response to this program solicitation. These restrictions apply to this SRN solicitation only and are not meant to inhibit submissions of proposals by investigators to other NSF activities or programs.

## Proposal Preparation and Submission Instructions

**A. Proposal Preparation Instructions**

- **Letters of Intent:** Not Applicable
- **Preliminary Proposals:** Submission of Preliminary Proposals is required. Please see the full text of this solicitation for further information.
- **Full Proposals:**
  - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
  - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)

**B. Budgetary Information**

- **Cost Sharing Requirements:** Inclusion of voluntary committed cost sharing is prohibited.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Not Applicable

**C. Due Dates**

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

  December 01, 2011

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

  April 01, 2012

## Proposal Review Information Criteria

**Merit Review Criteria:** National Science Board approved criteria apply.

## Award Administration Information

**Award Conditions:** Standard NSF award conditions apply.

**Reporting Requirements:** Standard NSF reporting requirements apply.

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## I. INTRODUCTION

A sustainable world is one in which human needs are met equitably without harm to the environment, and without sacrificing the ability of future generations to meet their needs. Meeting this formidable challenge requires a substantial increase in our understanding of the integrated system of society, the natural world, and the alterations humans bring to Earth. NSF's Science, Engineering, and Education for Sustainability (SEES) activities aim to address this need through support for interdisciplinary research and education.

Fundamental to all sustainability research is the simultaneous consideration of social, economic, and environmental systems and the long-term viability of those systems. Concepts that underlie the science of sustainability include complex adaptive systems theory, emergent behavior, multi-scale processes, as well as the vulnerability, adaptive capacity, and resilience of coupled human-environment systems. An important research goal is to understand how patterns and processes at the local and regional scales are shaped by and feed into processes and patterns that manifest at the global scale over the long term. These topics guide research to explore alternate ways of managing the environment, migrating from finite resources to renewable or inexhaustible resources, and applying technology to improve human well-being. Conceptual frameworks for sustainability, including general theories and models, are critically needed for such informed decision-making.

SEES activities span the entire range of scientific domains at NSF and aim to: 1) support interdisciplinary research and education that can facilitate the move towards global sustainability; 2) build linkages among existing projects and partners and add new participants in the sustainability research enterprise; and 3) develop a workforce trained in the interdisciplinary scholarship needed to understand and address the complex issues of sustainability.

Sustainability Research Networks (SRN) is a multi-directorate program, cooperatively managed by all eleven NSF Directorates and Offices, that is part of the SEES portfolio. The goal of the SRN competition is to support the development and coalescence of integrated research enterprises that will achieve trans-disciplinary knowledge built around pressing societal needs in sustainability. The research will cross the boundaries of climate, energy, and environmental sciences, as well as physical and computational sciences, social and behavioral sciences, and educational sciences. The fundamental goal of this research is to inform societal actions for future environmental, economic, social and cultural sustainability.

SRNs will support innovative and leading-edge, fundamental research on sustainability science, engineering and education (e.g., conceptual, empirical, synthetic, computational) which is of a trans-disciplinary and large-scale nature that would not be possible within a single institution, center, or even through the normal collaborative modes of NSF research support. The SRN program offers an avenue for collaborations within the academic research and education communities, as well as with international and private sector partners. Collaborations through SRNs will productively cross the boundaries of the traditional sectors of the natural sciences, engineering, computing, mathematics, statistical and computational sciences, the social and behavioral sciences, and the educational sciences. SRNs will produce discoveries and knowledge that will inform decisions leading to environmental, energy, social and cultural sustainability. SRNs may build on existing NSF programs and extend to others to improve predictions, technologies, policies and practices related to sustainability, harnessing renewable energy resources, building healthy environments and conserving biodiversity, while enhancing human well-being and economic vigor.

## II. PROGRAM DESCRIPTION

The SRN competition aims to support robust research collaborations that develop and strengthen research networks, and foster dialogue between highly-talented individuals from a spectrum of disciplines, sectors (e.g. research, education, policy), perspectives, and research methods. Networks will be unconstrained by institutional boundaries and may include an international reach. SRNs will connect interdisciplinary teams of investigators focused on performing cutting-edge research and education relating to the challenges of sustainability.

A number of general concepts underlie the science of sustainability, including complexity, emergent behavior, multi-scale processes, and adaptability and resiliency in coupled, human-environment systems. These topics guide research to define tradeoffs in alternate ways of managing the environment and applying technology to improve human well-being, to ensure robustness of social and environmental systems to disruption, and to anticipate thresholds or tipping points in response to rapid and gradual change. This research strives to understand how patterns and processes at the local and regional scales are shaped by - and feed into - processes and patterns that manifest at the global scale over the long term. Conceptual frameworks for sustainability, including general theories and models, are still in their infancy, yet are critically needed to help inform management and policy decisions. The SRN competition seeks to address this need through support for interdisciplinary research and education that strengthens fundamental understanding of sustainability science, engineering, and education that will help achieve more sustainable pathways of development and improve human well-being.

A. Characteristics of SRNs:

SRN networks will be built upon an ambitious and nationally important theme that links scientists, engineers, and educators, at existing institutions, centers, networks, and/or the development of new nodes and interactions. SRNs will foster new knowledge and tools at a frontier of research that significantly crosses and melds the boundaries of diverse disciplines, and forges what will be viewed as integrated science and engineering disciplines of the future. SRNs will pursue new opportunities in science, engineering and educational research that truly require the scale, scope, facilities and integration enabled by such a network.

SRNs might connect with previously funded entities, such as centers or large institutes, which investigate sustainability science and engineering topics. SRNs might include broadly based, interdisciplinary synthesis components intended to integrate data from many different sources to address questions related to a sustainable human future. SRN research might also include modeling and large scale data analysis. Not all activities comprising the SRN networks need to be NSF-supported entities, but the NSF expects that its role in SRNs is in fundamental support of the academic research community. SRNs are encouraged to include, as appropriate to the theme, international partners, as well as activities, centers and networks supported by other federal agencies; state, local, and tribal governments; or the private sector.

SRNs will be expected to form effective and integrated educational structures and processes, across and throughout the network that not only meet the goals of the SRN itself, but also train the next generation of researchers to meet the trans-disciplinary research needs of the future. An SRN is expected to include a broad spectrum of research and education training opportunities. An SRN will support education activities which facilitate the development of a diverse, internationally-competitive and globally-engaged workforce of scientists, engineers, educators and citizens who are well-prepared for a variety of career paths related to sustainability.

SRNs will also perform outreach activities that allow the results of the research to be made available to those who might potentially apply it to sustainability solutions. These activities will also aim to build a wider community of participants, including industrial partners, resource managers, etc.

The network concept clearly demands a multiplicity of individuals, institutions, connections, and arrangements with high levels of integration. The network will include linkages within and between: campuses and schools; centers; smaller networks; state, local, and tribal governments; federal agencies and national labs; and private sectors in the U.S. as well as internationally. The network will be managed as a whole, with one partner institution (and individual director) serving as the lead in terms of the overall administration and integration of the shared research, education, and goals of the SRN. This institution will accept the overall management and budgetary responsibility for the proposed SRN and each proposal **must include a detailed and justified management plan** that describes the essential role of the lead and each partner entity, as well as explaining the germane contributions of each entity to the integrated research and education goals of the SRN. Each proposal must include a management plan that will facilitate integrative, collaborative research of the entire network. A SRN will include research, cyberinfrastructure for simulation, modeling and data management, support for workforce development, mechanisms for community engagement in the SRN's thematic areas, and evaluation and assessment activities.

**SRN awards are expected to be 4 to 5 years in duration and budgets must not exceed $12,000,000 total per award. The budget requested must be consistent with the scope of the SRN network proposed.** ***Proposers are discouraged from asking for the maximum budget amount, unless the proposal outlines network activities that are consistent with this scope. The expectation is that initial years might have smaller budgets.***

B. Examples of SRN themes:

Below are noted several example SRN themes. **These examples are neither prescriptive nor priority statements with regard to NSF's specific interests about SRNs and the intent of this solicitation, but provided as the types of topics that an SRN could address.**

Energy and Materials Issues in Sustainability: To sustain the global energy and materials landscape, an SRN may build itself around the discovery of new chemistry, materials and processes for clean energy generation (solar, hydrogen, geothermal, wind, biomass, etc), processing of renewable resources, and replacements for scarce natural elements; using solar energy and novel catalysts for conversion of abundant molecules such as water, carbon dioxide and dinitrogen into, for example, feedstock chemicals or power plant fuels. In association with these technological advances, the SRN would also seek to improve understanding through the development of novel new theoretical/computational approaches for modeling, simulation and large scale data analysis of the physical and natural science processes impacting the intended efficient resource utilization, and assessing the robustness and resilience of these complex systems when subjected to destabilizing external forces and complex internal dynamics. The impact culturally and economically on the human-environment systems from arising fundamental shifts in resource utilization would also be targeted.

Urban Sustainability: More than half of the world's people now live in cities, and in the U.S., the figure is 80% (U.S. National Academies, "Pathways to Urban Sustainability: Research and Development on Urban Systems-Summary of a Workshop," The National Academies Press, Washington, D.C., 2010). Urban environments, both in the U.S. and abroad, spur economic development and allow for efficient use of resources, but their size means that cities consume resources at prodigious rates, in concentrated areas. Consequently, there is a need for research on how this trend of increased urbanization can be made more sustainable. A systems approach is required, with human-environment interactions at the urban-scale included. The overarching question is how

can we develop sustainable urban systems that provide healthy, safe, and affordable environments for the growing number of Americans and others living in cities and their surrounding metropolitan areas across the globe?

Large Scale Energy Production and Consumption Dynamics: Driven by climate change and energy security concerns, the world is moving towards a model where energy production & distribution and storage becomes highly distributed, variable in scale (from large utility plants down to home or vehicular level operations), and is likely to involve a large number of technologies. At the same time, it is becoming technologically feasible to achieve significant reduction in consumption by large scale monitoring, coordination, intelligent control, education, and societal pressure. The major energy consumers in a society are transportation, residential and industrial/commercial. An intelligent, secure, multi-level management of energy in each of these sectors or a combination of them that considers interplay between production and consumption, and the considerations of the physical and social environment they operate in, can go a long way in enhancing energy sustainability.

Coastal System Vulnerability and Resilience: Home to more than one-half the world's population, the band of land and water that geographically defines coastal zones represents a distinctive interface characterized by a dynamic intersection of geological, ecological, oceanic, atmospheric, and social processes. Hotspots of urban development and global trade are located along coasts, yet coastal zones also encompass the most biologically productive and diverse ecosystems on the planet. Coastal systems are especially susceptible to disruption from extremes of weather, tectonic forces, human activity, and environmental changes associated with global warming. In the U.S., Alaska contains at least 50% of the total U.S. coastline and is facing the most rapid and severe climate changes, which threatens the health and cultural well-being of northern indigenous peoples and arctic residents. Coastal zones therefore represent complex, heterogeneous, and vulnerable systems of vital importance to regional and national economies and to critical ecosystem services that sustain human well-being. As a consequence of the distinctive interaction of physical and ecological processes, geographic intensity of human activities, and risk of natural and human-induced hazards, coastal systems present special challenges and opportunities to advance general understanding of vulnerability and resiliency in complex interacting systems.

Altered Biogeochemistry of Earth Systems: Many earth systems are being altered by the large-scale changes in the fundamental biogeochemical cycles on our planet. For example, manufactured nitrogen fertilizers and mined phosphorus used for agricultural production are changing ecosystem nutrient balances, yielding coastal, riverine, and lake eutrophication, and drinking water quality deterioration. Biogenic fossil fuels provide the energy foundation of society but are the source of $CO_2$ additions to our atmosphere and oceans that are warming the planet, acidifying the seas, and influencing the weather and long-term climate patterns of the earth. The alterations are strongly linked to human well-being through food production and water quality, economic development, and social change, but they are also strongly linked to the loss of ecosystems services, diminishing biological diversity, and the impacts on social and cultural systems. An SRN might encompass the fundamental research, needed to integrate the consequences of these biogeochemical changes on the environment and human communities, as well as consideration of the opportunities, pathways and tradeoffs for proposed environmental engineering solutions, and smart use of new technologies for energy and materials.

Sustainability of Freshwater Supplies: Water Sustainability is a social challenge because the complexity of responses of individuals and communities tends to increase with decreasing resource availability, and adaptive decisions choose winners and losers. The lack of a comprehensive knowledge of patterns and policies for water and energy uses, and their interconnections in the US, limits the ability to apply the adaptive management necessary to maintain energy and water security. Sustainability of the freshwater supply is a problem of hydrology and hydrometeorology, as we wrestle with predicting water fluxes and quality at decadal and regional scales; a problem of biology and conservation, as water availability and quality are determinants of ecosystem health; a problem of economics because of the inherent link of water supplies to food production, energy and industrial uses; and a problem of engineering as engineers design, install, and operate the freshwater supply and treatment systems of the nation.

Food Security and Land Use Change: Food production is vital to the populations of the world; it is the most fundamental element of human well-being and is intricately tied to the social and economic dynamics of the world. Production is intimately tied to energy and water use, technological developments in harvesting and culturing food species, education, human health, preservation of human culture, and the environment's ability to provide such critical ecosystems services. A SRN might be developed around improving our understanding of the economic and culture drivers for change in food provision, the long-term changes within environment systems that impact food sustainability (changes in soil and water quality attributes, the water cycle, erosion, oceanic ecosystems and physical processes, competing spatial use patterns on land, coastlines and the oceans), and examining the tradeoffs necessitated by technological innovation.

**Again, these example themes must neither be viewed as prescriptive nor as priority statements with regard to NSF's specific interests about SRNs and the intent of this solicitation.** We expect the nation's science, engineering and educational research communities to propose network level research that is truly innovative and challenging, addresses vitally important issues pertaining to sustainability for the future, and clearly requires the scale, scope and integrative nature of an SRN to achieve significant results.

## III. AWARD INFORMATION

**Anticipated Type of Award:** Cooperative Agreement

**Estimated Number of Awards:** 3 to 4 SRNs, pending quality of proposals submitted and availability of funds.

**Anticipated Funding Amount:** $36,000,000 pending availability of funds. **SRN awards are expected to be 4 to 5 years in duration and budgets must not exceed $12,000,000 total per award.** The budget request must be consistent with the scope of the SRN network proposed. ***Proposers are discouraged from asking for the maximum annual budget amount, unless the proposal outlines network activities that are consistent with this scope.***

## IV. ELIGIBILITY INFORMATION

**Organization Limit:**

Proposals may only be submitted by the following:

- Preliminary proposals and invited full proposals may be submitted by U.S. academic institutions accredited in, and having a campus located in the U.S., that have research and degree-granting

education programs in any area of research supported by NSF. The lead institution is expected to develop partnerships or arrangements with other universities/colleges, or other institutions such as national laboratories; research museums; private sector; state, local, and tribal governments; non-governmental organizations; and international collaborators, as appropriate, to enable the SRN to attain its strategic goals.

**PI Limit:**

None Specified

**Limit on Number of Proposals per Organization:** 3

A single organization may submit a maximum of three preliminary proposals as the lead institution. Full proposals are to be submitted only when invited by NSF. There is no limit to participation as a partner institution. It is not likely that the SRN program will provide support for more than one SRN from any one lead institution in this competition.

**Limit on Number of Proposals per PI:** 1

An individual may appear as Lead Principal Investigator (PI) on only **one** SRN proposal submitted in response to this program solicitation. These restrictions apply to this SRN solicitation only and are not meant to inhibit submissions of proposals by investigators to other NSF activities or programs.

## V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

### A. Proposal Preparation Instructions

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

When preparing a preliminary proposal for this competition, proposers are advised to consult the Program Description for general information pertinent to the SRN program and the Proposal Review Information found in section VI of this solicitation for information on specific questions that reviewers of preliminary proposals will be asked to address. Required components of the preliminary proposal are given below. Strict adherence to page limitations given in this document is required. Proposers should review the most current NSF Grant Proposal Guide (GPG) for specific information on signatures and format for the required sections.

**Preliminary Proposal Contents**

The preliminary proposal should consist of the following elements:

1. Cover Sheet. For planning purposes, use the last Monday of September as the start date. The proposed **SRN Director must be shown as the Principal Investigator**.

2. Project Summary. (1 page maximum) Provide an overview of the proposed SRN, addressing separately the intellectual merit and broader impacts of the SRN. The summary should be written in the third person, informative to those working in the same or related field(s), and understandable to a scientifically or technically literate reader.

3. Table of Contents. A Table of Contents is automatically generated for the proposal by the FastLane system. The proposer cannot edit this form.

4. Project Description (8-pages maximum). The Project Description should articulate a vision for the proposed SRN that clearly outlines the grand challenges being addressed or breakthroughs being sought. The proposed research and network activities should be sufficiently complex and large-scale to justify an SRN and flexible enough to permit change as the research proceeds. The proposed approaches must be innovative, and it must be clear how the integrated network activities will transform our knowledge of, and lead to significant impact on, issues relating to environmental, energy, social and cultural sustainability. The Project Description must describe how the integration of research and education in the SRN will advance the SRN research theme in a way that other funding mechanisms cannot. A justification for the focus of the education and outreach activities should be included and described in the context of current knowledge of teaching and learning. Include a description of the leadership team members and why each is essential to the project plan (**must not be more than 2 pages**). In addition to an outline of the proposed SRN research theme, some illustrative examples of specific research directions with sufficient detail to be evaluated by reviewers should be included. ***Results from Prior NSF Support should not be included***. Links to URLs may not be used.

5. References Cited (2-page limit). See NSF GPG instructions.

6. Biographical Sketches (2-page limit per person). Biographical Sketches are only required for the SRN Director and the members of the leadership team, which comprises up to 3 senior personnel per institution. See GPG for details.

7. Management Plan (2-page limit): Include an outline of the proposed Management Plan for the SRN. This plan must also show how proposers plan to manage collaborative partners.

8. Supplementary Documents: (to be entered in the Supplementary Documents section of Fastlane). A list of Partner Institutions, Organizations, and Project Personnel is required. This information provides NSF and reviewers with a comprehensive list of personnel and institutions involved in the SRN.

a. List all project personnel who have a role in the management, research, education, and outreach components of the SRN. Use the following format:

Project Personnel:

last name, first name, institution/organization

b. Additionally, provide a separate list of all institutions and organizations for which there are corresponding project personnel organized into the following categories: Academic institutions; National Laboratories; Research

Museums; Federal Government; State, Local, and Tribal Government; Industry; Non-Governmental Organizations; and International institutions.

For preliminary proposals, no other items or appendices are to be included. Do **not** include information pertaining to "Current and Pending Support", and "Facilities, Equipment and Other Resources". Preliminary proposals containing items other than those required above will be returned without review.

**Optional Information to be submitted to NSF via the FastLane Single Copy Documents Section.**

- List of suggested reviewers or reviewers not to include (with a brief explanation or justification for why the reviewer should be excluded);
- Proprietary or privileged information (if applicable).

**Required Information to be submitted to NSF via email.**

The proposer is required to send a single spreadsheet per project listing conflicts of interest to NSF via email. After receipt of the proposal number from FastLane, send an email to SRN@nsf.gov. The subject heading of the email should note the proposal number. In the body of the email provide the proposal number, the PI name, and the name of the lead institution. Attach a list of participants, partners, and their conflicts of interest. This **table must be submitted within one week following the proposal submission deadline** and will be used by NSF to check for conflicts of interest in assembling the review community. Remember to email this table to SRN@nsf.gov; do NOT submit it through FastLane.

**Full Proposal Preparation Instructions:** Proposers may opt to submit proposals in response to this Program Solicitation via Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

Full proposals will be accepted only if invited by NSF. Due to the complexity of the proposals being submitted, use of FastLane to prepare and submit invited full proposals is strongly encouraged. When preparing a full proposal for this competition, proposers are advised to review the Program Description and the Proposal Review Information found in this solicitation for general information pertinent to this program. Proposers are encouraged to review the most current NSF ***Grant Proposal Guide*** (GPG) for specific information on signatures and format for the required sections.

The full proposal should provide much more detail than the preliminary proposal and include information on implementation plans and assessment. Descriptions should be clear and concise. Every effort should be made to update information that was provided in the preliminary proposal and to fully address issues raised in the preliminary proposal review. Full proposals should be comparable in scope and effort to that which was presented in the preliminary proposal. Required proposal components and additions to, or differences from, the NSF GPG are given below.

**Full Proposal Contents**

**Required Sections of the Full Proposal**

The full proposal **must include only the main documents and supplementary documents described in Sections 1-14**, below.

1. Cover Sheet. For planning purposes, use the last Monday of September as the start date. The full proposal **must show the proposed SRN Director as the Principal Investigator**. Include the pre-proposal number and follow instructions provided in FastLane and GPG.

2. Project Summary. Both NSF merit review criteria (intellectual merit and broader impacts) **must be addressed in separate statements** (see NSF Grant Proposal Guide for additional instructions). The summary should be written in the third person, and be informative to persons working in the same or related fields, and understandable to a scientifically or technically literate lay reader. Provide a clear and concise description of the SRN including rationale, mission, vision, as well as education and outreach plans.

3. Table of Contents. A Table of Contents is automatically generated for the proposal by the system. The proposer cannot edit this form.

4. Project Description. The Project Description **must contain only Sections (4.a) through (4.e)** described below and **cannot exceed 25 pages** including tables and illustrations. The broader impacts resulting from the proposed project **must be addressed and described as an integral part of the narrative**.

(4.a) Rationale for SRN Approach: Explain the unique opportunities that an integrated SRN will provide and describe what will be achieved through the integrated network activities that could not be achieved with group or individual support. Discuss the strategic goals of an integrated SRN. Describe the expected legacy and national and/or global impact of the proposed SRN for sustaining human well-being in a healthy Earth System.

(4.b) Research and Network Objectives of the SRN: State the overall vision and research goals of the integrated SRN. Describe the proposed research areas/themes, how they integrate with each other to realize the SRN's research vision. Provide timelines for the activities. Indicate how each network node, partner organization or participant will contribute to the overall network. The research focus and network scope should be sufficiently long-term to justify an SRN and flexible enough to permit change as the research proceeds. Provide a research plan

with sufficient detail to allow assessment of the scientific merit and to justify the necessity for the SRN mode of operation.

Indicate the potential impact or expected significance that the SRN's research and network activities will have on the Nation's scientific and educational efforts toward achieving a sustainable future. Include a description of current research activities and, if the proposed SRN research is closely related to an established Network, explain how the research activities of the proposed Network complement, as well as differ, from those of existing Networks. Describe the plans for coordination and cooperation among the relevant networks. Explain how the proposed research relates to other state and national research capabilities, as well as international programs, in the proposed fields of research.

(4.c) Education, training, and Broadening Participation of Underrepresented Groups: Present an innovative education plan that describes how the SRN will integrate research, education, and activities that involve public participation and engagement such as citizen science activities and public deliberation and dialogue. The education goals of an SRN may address the needs of students participating in SRN research activities or students in broader fields of research represented by the SRN activities as appropriate. SRNs are encouraged to focus their education efforts on specific programs that are appropriately integrated into the research activities of the SRN rather than attempting to be comprehensive. Describe plans for the mentoring and professional development of participants at all levels, including undergraduate and graduate students, postdoctoral researchers, and early career faculty. Name the lead organizations and key individuals involved with individual projects, and explain the potential contributions and role of each in the education activity. Describe the process by which the education and human resource development goals will be established, used to guide the formal evaluation approaches, and modified during the award period, if needed. Provide timelines for all activities and explain how and when progress toward these goals will be measured.

Describe plans for attracting and retaining a diverse group of students, postdocs, faculty and administrative staff, including U.S. citizens, nationals and permanent residents**,** and those from underrepresented groups, in the SRN research and education activities. Describe the proposed activities in sufficient detail to allow assessment of their intrinsic merit, potential effectiveness, and their anticipated contribution toward a highly competent and globally engaged technical and instructional workforce and educated citizenry. Demonstrate that the SRN leadership has critically considered broadening participation for groups underrepresented in the sciences, mathematics and engineering AND describe the diversity objectives and outline strategies for achieving them at all organizational levels of the SRN activities. Include the contribution/role of partner organizations and how they will be fully integrated into the SRN diversity plans.

(4.d) Management Plan for the SRN: Develop and present a management plan for the integrated SRN including a diagram to explain the organizational relationships and reporting structure among the key areas of responsibility. Identify key members of the SRN Management Team and explain their specific roles and areas of responsibility. The SRN Director must have the capacity to develop and lead a diverse team for fulfilling the vision of the SRN. Key members of the SRN Management Team must have the management experience and qualifications to administer their component of the SRN. Identify responsibilities of the lead and partner organizations. Explain the role of each key participant/component and explain the approach for integrating and managing all partners. Describe the processes to be used to prioritize SRN activities; to select and integrate research projects with one another and with other SRN activities; to allocate funds and equipment across SRN activities and among partners; and succession plans for the SRN leadership team if necessary.

(4.e.) Results from Prior NSF Support: PI, co-PIs, and Senior Personnel who received NSF funding in the past five years must provide information on the prior award(s), major achievements and relevance to the proposed SRN project. Individuals who have received more than one prior award (excluding amendments) must report on the award most closely related to this proposal. Required information is described in the Grant Proposal Guide."

**An external advisory committee (EAC) will be required to provide guidance and advice to the SRN on all activities, but it is not required to assemble members at this stage.** ***Do not name prospective members of the EAC here.*** **If a proposal is selected for a site visit, NSF will require more detailed information on the EAC and the overall management plan for the SRN.**

5. Facilities, Equipment and Other Resources. Provide a synopsis of institutional resources that will be available to the SRN (dedicated space, access to facilities and instrumentation, faculty and staff positions, access to programs that assist with curriculum development or broadening participation of groups underrepresented in the sciences mathematics and engineering, or other institutional programs that could provide support to the SRN). In order for NSF, and its reviewers, to assess the scope of a proposed project, all resources (including those from partner organizations) available to the project, must be described in this section. Note that inclusion of voluntary committed cost sharing is prohibited. The description should be narrative in nature and must not include any quantifiable financial information. See GPG Chapter II.C.2.i for further guidance.

6. Budget and Budget Justification. Provide a budget for each of the five years. FastLane or Grants.gov will automatically provide a cumulative budget. The proposed budget should be consistent with the needs and complexity of the proposed activity. The budget and budget justification should reflect start-up activities at the commencement of the SRN activities. **Funds allocated for research, education, broadening participation, and outreach activities must be discernible.** Identify items of equipment costing more than $10,000. Full justification for the latter is required. Individual graduate students may not be supported for a period in excess of five years.

Attach subaward budgets and budget justifications for each participating institution. Since SRN does not accept separately submitted collaborative proposals, the submitting lead institution will manage funds allocated to participating institutions as subawards.

For projects involving international collaborations:

- **Other Direct Costs:** May include, for example, research and education communication linkages between institutions, language training, non-travel costs associated with coordination meetings, and preparation/orientation of students for living abroad. Collaborative research-related activities at foreign sites by **U.S. undergraduate students, graduate students, and/or early career researchers** also can be funded through direct costs.
- **Participant Support Costs:** Stipends, travel, subsistence and other costs of participation for undergraduate students or K-12 teachers should be included under Participant Support Costs. Stipends for undergraduate students should be budgeted at rates comparable to those in the Research Experiences for Undergraduates (REU) program (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5517), in addition to any travel and subsistence costs incurred while abroad. Travel, subsistence and other costs of participation in project meetings and workshops for faculty, researchers and students from non-grantee institutions (who are not included in subawards) also should be included under Participant Support Costs.
- **Travel:** Research-related travel support (i.e., airfare, lodging, meals, and incidental expenses). For living expenses abroad,

applicants are encouraged to work with international counterparts to develop realistic budget requests. For example, access to university guest housing or similar facilities should be explored. Cost-effective arrangements should be made for individuals residing at the international site for extended periods and for projects involving on-going exchanges of short-term visitors. Costs for lodging, meals and incidental expenses (MI&E) should not exceed the authorized U.S. Government per diem rates, calculated at the daily rate for the first 30 days of a project visit, and 50 percent of that rate for all time after that.

- **Visas and Permits:** PIs are responsible for obtaining any required visas for foreign travel and through the U.S. research institution, for providing documentation in support of U.S. visas for foreign counterpart investigators. PIs are also responsible for obtaining research permits and import/export documents, where necessary.
- **NSF awards normally support the U.S. portion of the collaboration.** International partners are expected to seek support from their respective funding organizations. The NSF budget may be used to support: (1) travel expenses for US scientists and students participating in exchange visits integral to the project; and (2) Project-related expenses to US participants to engage in research activities while abroad. However, when collaborators are scientists and engineers from a developing country or from a country whose currency is not convertible, limited funds may be requested to support their participation in the project. Proposers should consult the cognizant NSF Office of International Science and Engineering (OISE) program officer for the country(ies) in question (http://www.nsf.gov/od/oise/country-list.jsp).
- Although reciprocal visits by international researchers and students to U.S. institutions are encouraged, NSF will not usually pay for the expenses of foreign scientists or students undertaking such visits. However, when projects involve exchanges of researchers and/or students, reciprocal arrangements for provision of housing and subsistence are encouraged, with adherence to the overall principle that each side supports equivalent services.

7. References Cited. Section not to exceed five pages.

8. Biographical Sketches (two page limit per person). Biographical Sketches are only required for the SRN Director and the members of the leadership team, which comprises up to 3 senior personnel per institution. See GPG for details. Copies of publications should not be included or sent to NSF.

9. Current and Pending Support. Provide current and pending support information for the PI and all members of the leadership team for whom biographical sketches have been provided.

**Special Information and Required Supplementary Documents (Sections 10-15):**

10. (Required information to be entered in the Supplementary Documents section in FastLane. For Grants.gov users, supplementary documents should be attached in Field 11 of the R&R Other Project Information Form.)

(10 a.) Partner Institutions and

(10 b.) Project Personnel. The list of Partner Institutions and Project Personnel that were required in the preliminary proposal must be updated to reflect any changes occurring since the time of preliminary proposal submission.

11. Letters of Collaboration. This section should include any letters of collaboration from individuals or organizations that are integral parts of the proposed project, such as the involvement of collaborator organizations that are not supported by sub-awards or documentation of permission to access sites, materials, or data for research or other associated project activities. Letters of collaboration should focus solely on affirming that the individual or organization is willing to collaborate on the project as specified in the project description of the proposal. ***No additional text, especially elaboration of the nature of activities to be undertaken by the collaborator and endorsements of the potential value or significance of the project for the collaborator, may be included.*** A template that should be used for the preparation of letters of collaboration is provided below. **Each statement must be signed by the designated collaborator.** Requests to collaborators for letters of collaboration should be made by the PI well in advance of the proposal submission deadline, because **they must be included at the time of the submission of the full proposal.** Letters deviating from this template are not accepted and may be grounds for returning the proposal without review.

Letters of collaboration are not required for any individual designated as a principal investigator, member of the leadership team, or senior personnel, nor are letters of collaboration required for any organization that will be a sub-awardee in the proposal budget. (Inclusion of biographical sketches and current and pending support statements for individuals and sub-award budgets for organizations are considered to be implicit statements affirming involvement in the proposed project.)

The project description should document the nature and need for all collaborations. **Each statement must be signed by the designated collaborator**. Requests to collaborators for letters of collaboration should be made by the PI well in advance of the proposal submission deadline, because **they must be included at the time of the submission of the full proposal.** Letters deviating from this template are not accepted and may be grounds for returning the proposal without review.

***Template to be used for letters of collaboration***

To: NSF SRN Program

From: _____

(Printed name of the individual collaborator or name of the organization and name and position of the official submitting this memo)

By signing below (or transmitting electronically), I acknowledge that I am listed as a collaborator on this SRN proposal, entitled "_____(proposal title)_____," with _____(PI name)_____ as the Principal Investigator. I agree to undertake the tasks assigned to me, as described in the proposal, and I commit to provide or make available the resources designated in the proposal.

Signed: _____

Organization: _____

Date: _____

12. Data Management Plan. This document should describe how the proposal conforms to NSF policy on the dissemination and sharing of research results, which provides that investigators are expected to share with other researchers, at no more than incremental cost and within a reasonable amount of time, the primary data, samples, physical collections, software, curriculum materials, and other supporting materials created or gathered in the course of work under NSF grants. The following items should be included in this subsection:

- the types of data, samples, physical collections, software, curriculum materials, and other materials to be produced in the course of the project;

- the standards to be used for data and metadata format and content (where existing standards are absent or deemed inadequate, this should be documented along with any proposed solutions or remedies);
- policies for access and sharing including provisions for appropriate protection of privacy, confidentiality, security, intellectual property, or other rights or requirements;
- policies and provisions for re-use, re-distribution, and the production of derivatives; and
- plans for archiving data, samples, and other research products, and for preservation of access.

Links to data management requirements and plans relevant to specific Directorates, Offices, Divisions, Programs or other NSF units are available on the NSF website at http://www.nsf.gov/bfa/dias/policy/dmp.jsp. See Chapter II.C.2.j of the GPG for further information about the implementation of this requirement.

13. Postdoctoral Researcher Mentoring Plan. Each proposal that requests funding to support **postdoctoral researchers must include, as a supplementary document**, a description of the mentoring activities that will be provided for such individuals. The mentoring plan must describe the mentoring that will be provided to all postdoctoral researchers supported by the project, irrespective of whether they reside at the submitting organization. Proposers are advised that the mentoring plan may not be used to circumvent the Project Description page limitation.

**Optional Information to be submitted to NSF via the FastLane Single Copy Documents Section.** If submitting via Grants.gov, complete the information and attach as a PDF file (see Field 6, Additional Single Copy Documents, on the NSF Grant Application Cover Page).

- List of suggested reviewers or reviewers not to include (with a brief explanation or justification for why the reviewer should be excluded);
- Proprietary or privileged information (if applicable).

Full proposals containing items other than those described above will be returned without review.

**Required Information to be submitted to NSF via email.**

The proposer is required to send a spreadsheet listing conflicts of interest to NSF via email. After receipt of the proposal number from FastLane, send an email to SRN@nsf.gov. The subject heading of the email should note the proposal number. In the body of the email provide the proposal number, the PI name, and the name of the lead institution. Attach a list of participants, partners, and their conflicts of interest. **This table must be submitted by one week following the full proposal submission deadline** and will be used by NSF to check for conflicts of interest in assembling the review community. Remember to email this table to SRN@nsf.gov; do not submit it through FastLane.

**Proposals Involving Multiple Institutions**

In the case of proposals involving multiple organizations, a single organization must be identified as the lead, and a single proposal describing the entire project must be submitted by that organization. Funds may be distributed among partner organizations via subawards from the lead organization. A budget on the standard NSF budget form should be submitted for each subawardee. The requirement for a single organization to submit the sole proposal for a project is designed to facilitate effective coordination among participating organizations and to avoid difficulties that ensue in funded projects when individuals change organizations and/or cease to fulfill project responsibilities.

Of the two types of collaborative proposal formats described in the *Grant Proposal Guide*, this solicitation allows only a single proposal submission with subawards administered by that lead organization.

**Proposals Involving Collaborators at Foreign Organizations**

Proposers are reminded they **must provide biographical sketches of all senior project personnel, including those associated with foreign organizations on the leadership team**. Letters of collaboration should be provided as supplementary documents.

**Lead Institution and Sub-Awardee Institutions**

In accordance with the applicable award terms and conditions, proposers are reminded of their responsibilities with regard to sub-awardees. Should an award be made, the prime awardee is responsible for management and oversight of any sub-awardees on the project, including any foreign sub-awardees. All institutional components will be implemented as subawards from the submitting lead institution. ***Separately submitted collaborative proposal components will not be accepted.***

## B. Budgetary Information

**Cost Sharing:** Inclusion of voluntary committed cost sharing is prohibited

## C. Due Dates

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

  December 01, 2011

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

  April 01, 2012

## D. FastLane / Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

  Detailed technical instructions regarding the technical aspects of preparation and submission via FastLane are 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.

***Submission of Electronically Signed Cover Sheets.*** The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the Grant Proposal Guide for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane Website at: https://www.fastlane.nsf.gov/fastlane.jsp.

- **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://www07.grants.gov/applicants/app_help_reso.jsp. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding 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.

## VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

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

A comprehensive description of the Foundation's merit review process is available on the NSF website at: http://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 *Empowering the Nation Through Discovery and Innovation: NSF Strategic Plan for Fiscal Years (FY) 2011-2016*. 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 core strategies 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 provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students, and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the variety of learning perspectives.

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

### A. Merit Review Principles and Criteria

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

1. Merit Review Principles

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

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

of these activities may best be done at a higher, more aggregated, level than the individual project.

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

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

2. Merit Review Criteria

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

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

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

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

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

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

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

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

All NSF proposals are evaluated through use of the two National Science Board (NSB)-approved merit review criteria: intellectual merit and the broader impacts of the proposed effort. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two NSB-approved merit review criteria are listed below. The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which the reviewer is qualified to make judgements.

**What is the intellectual merit of the proposed activity?**
How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

**What are the broader impacts of the proposed activity?**
How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

Examples illustrating activities likely to demonstrate broader impacts are available electronically on the NSF website at: http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf.

Mentoring activities provided to postdoctoral researchers supported on the project, as described in a one-page supplementary document, will be evaluated under the Broader Impacts criterion.

**Additional Solicitation Specific Review Criteria**

Preliminary proposals, full proposals and site visits will be reviewed using the standard NSF review criteria described above. Within the intellectual merit and broader impacts criteria, reviewers will also be asked to address the following SRN-specific questions during the various stages of the competition:

1. **Preliminary Proposals.** Reviewers will be asked to consider the vision and potential impact of the research

proposed, along with the need for the SRN funding mechanism. Questions to be considered include:

- Is the vision for the proposed SRN sufficiently compelling, ambitious and complex to justify the large-scale investment?
- How well do the proposed research and educational activities integrate across NSF-supported disciplines, such as creating new interdisciplinary networks and/or collaborations?
- How well do the proposed activities advance the foundations of sustainability by including a strong conceptual framework that addresses the social, economic, and environmental components?
- Will the proposed SRN advance fundamental scientific and engineering knowledge, as well as address the long-term goal of overcoming barriers to sustainable human well-being and to forging reasoned pathways to a sustainable future?
- Are the approaches proposed for addressing the SRN's theme innovative and flexible enough to permit change as the research proceeds?
- How is the proposed structure and management for the proposed SRN appropriate, if not essential, for the planned network? How do included partners contribute to goals and objectives of the research and educational activities? Does the proposed network leverage existing nodes of research and education such that synergisms are created to enhance the success of the SRN?
- How will the proposed activities advance the development of a workforce skilled in the interdisciplinary scholarship needed to understand and address the complex issues of sustainability?
- Are the plans for education, training, and increasing the participation of underrepresented groups appropriate for the planned network?

2. **Full Proposals.** In addition to the review criteria that will be addressed in reviewing preliminary proposals (above), reviewers will be asked to consider the integrative nature of the proposed SRN. Questions to be considered include:

- Are there appropriate plans for partner organizations and communities to be meaningfully engaged and participate in an SRN network?
- Does the proposal include a vision and plan for leadership in broadening participation of underrepresented groups and does it articulate a credible commitment to diversity as a means of achieving its overall goals?
- Are the educational activities innovative and do they contribute to the unifying mission of the proposed SRN?
- Are there appropriate plans to promote community participation and engagement through the meaningful exchange of scientific and technical information with external stakeholders such as academic institutions; National Laboratories; museums; federal government; state, local, and tribal government; private industry; non-governmental organizations; and international institutions.
- Does the proposed SRN management team have the vision, experience, and capacity to manage a complex, multifaceted, and innovative enterprise that integrates research, education, diversity and outreach at the network level.

3. Site Visits. The full scope of questions applicable for prior stages in the competition will be within the purview of the site visit team. The site visit team will give special consideration to the management and budget of the proposed SRN and any outstanding issues that were raised during the review process. **If the proposed SRN is selected for a site visit, more details will be provided about the site visit requirements.**

NSF staff also will give careful consideration to the following in making funding decisions:

***Integration of Research and Education***
One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

***Integrating Diversity into NSF Programs, Projects, and Activities***
Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- 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.

## B. Review and Selection Process

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

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. 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 is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, 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.

In all cases, 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 and 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.

## 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 letter, 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 letter; (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 letter. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

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

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

### 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 at least 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). Within 90 days following expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

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

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

More comprehensive information on NSF Reporting Requirements and other important information on the administration of NSF awards is contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

## 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:

- Sarah L. Ruth, telephone: (703) 292-8521, email: srn@nsf.gov
- Bruce K. Hamilton, telephone: (703) 292-8320, email: srn@nsf.gov
- Alan J. Tessier, telephone: (703) 292-8481, email: srn@nsf.gov
- Krishna Kant, telephone: (703) 292-8950, email: srn@nsf.gov
- Alphonse T. DeSena, telephone: (703) 292-5106, email: srn@nsf.gov
- Haiyan Cai, telephone: (703) 292-4777, email: srn@nsf.gov
- David McGinnis, telephone: (703) 292-7307, email: srn@nsf.gov
- Carleen F. Maitland, telephone: (703) 292-7225, email: srn@nsf.gov
- Anna M. Kerttula de Echave, telephone: (703) 292-7432, email: srn@nsf.gov
- Sarah Ruth, telephone: (703) 292-8521, email: sruth@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.

Questions regarding the Sustainability Research Network solicitation should be sent to SRN@NSF.GOV.

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A proposed new SRN solicitation is being prepared. If this new solicitation is approved, it is expected that it will be posted in fall 2013 with a full proposal deadline during winter 2014. No preliminary proposals are planned.

## 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, "My NSF" 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. "My NSF" also is available on NSF's website at http://www.nsf.gov/mynsf/.

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this new mechanism. Further information on Grants.gov may be obtained at http://www.grants.gov.

## ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

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

*Facilitation Awards for Scientists and Engineers with Disabilities* provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

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

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

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

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

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information** (NSF Information Center)**:** (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**

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

  or telephone: (703) 292-7827
- **To Locate NSF Employees:** (703) 292-5111

## PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and NSF-51, "Reviewer/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

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

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

## X. APPENDIX

**Sustainability Frequently Asked Questions (SRN FAQ's)**

**1. What is the difference between a SRN and a Center, such as a STC or an ERC?**

**Answer:**

A Center

- Does not require a network framework to be successful, although sometimes they do
- Can be largely within a discipline reaching out to others for research progress, but based strongly from the framework of an existing discipline, or can be a set of closely aligned disciplines

A SRN

- Requires a network framework, showing the links amongst elements, nodes, people, and institutions
- Requires a highly interdisciplinary approach where the research directions derive from the synergism of research questions and approaches
- Requires specific strong inclusion of human dimensions of sustainability: well-being, impacts and adaptation of people, their social and economic constructs

**2. We want to start a degree program in Sustainability. Can this be part of our SRN?**

**Answer:** The focus of SRNs is research. Designing a new degree program would not be the primary focus of a SRN, although the educational component might include some new curriculum.

**3. Must our SRN include aspects of both social science and economics?**

**Answer:** SRNs are expected to advance the foundations of sustainability by including a strong conceptual framework that addresses the social, economic, and environmental components. See review criteria.

**4. Is SRN funding for only 5 years or is there a chance for renewal of funding beyond the 5 year award?**

**Answer:** Initial SRN awards will be for 5 years' duration. Awardees should plan on only 5 years of funding, since the availability of funds after that time period is unpredictable.

**5. Should I submit a budget with my preliminary proposal?**

**Answer**: No, you should not submit a budget with your preliminary proposal.

**6. I In the RFP it says "Biographical Sketches are only required for the SRN Director and the members of the leadership team, which comprises up to 3 senior personnel per institution." The SRN Director is on the Leadership Team, but is the SRN Director included in the 3 senior personnel per institution limit?**

**Answer:** Yes, the SRN Director is included in the 3 senior personnel per institution limit.