EPA / NSF Networks for Characterizing Chemical Life Cycle (NCCLCs)

PROGRAM SOLICITATION
NSF 13-524

National Science Foundation

Directorate for Mathematical & Physical Sciences
Division of Chemistry

EPA: Office of Research and Development / National Center for Environmental Research

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

March 18, 2013

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. Proposers who opt to submit prior to January 14, 2013, must also follow the guidelines contained in NSF 13-1.

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.

For proposals to be further considered for funding by EPA, the principal investigator will be asked to withdraw his/her proposal from NSF and resubmit to EPA according to EPA instructions found at http://www.epa.gov/ncer/EPA_Eligibility_Policy_Reqs/. Proposers will be required to submit additional information and an electronic version of the revised project abstract. They may also be asked to provide responses to comments or suggestions offered by the peer reviewers and/or a revised budget. EPA Project Officers will contact the Principal Investigator to obtain these materials. Before or after an award, proposers may be required to provide additional quality assurance documentation.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

EPA/NSF Networks for Characterizing Chemical Life Cycle (NCCLCs)

Synopsis of Program:

This solicitation is jointly sponsored by the U.S. Environmental Protection Agency (EPA) and the U.S. National Science Foundation (NSF) Division of Chemistry (CHE) to encourage synergy and enhance cooperation in examining the life cycles of synthetic chemicals and materials as they relate to their manufacture, use, transport, and disposal or recycle. The Networks for Characterizing Chemical Life Cycle (NCCLCs) will promote development of trans-disciplinary, systems- and molecular-level understanding of the life cycle of important (relevant) synthetic chemicals and materials (including nanomaterials) as these distribute and are potentially altered through use in society and interaction with the built and natural environments. For this solicitation, "chemicals" refers broadly to any and all materials, compounds, and individual chemicals or mixtures of chemicals, including nanomaterials. Advances resulting from these Networks are expected to provide methods and tools for characterizing and predicting environmental and health implications of chemical manufacture and use across the life cycle.

Education, workforce development, and the translation or transfer of basic research results into social or economic benefits are critical aspects of NCCLC projects. Networks will develop strong mentoring and training activities (which include broadening participation elements) for undergraduate and graduate students as well as postdoctoral associates. Other educational activities, such as informal science communication and the education of K-12 students or the public, are encouraged. Where appropriate, intellectual property protection and a proactive plan to engage industry in technology transfer is encouraged.

It is expected that research teams in the NCCLC awarded under this solicitation will coordinate / communicate with the funded research networks from the EPA/NSF Networks for Sustainable Molecular Design and Synthesis (NSMDS) solicitation (see: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504822). The researchers working in these two network groups are expected to conduct complementary research and; thus, will benefit from interaction with each other at annual EPA All-Investigators Meetings (also known as progress reviews).

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.

- Tyrone D. Mitchell, Program Director, NSF Chemistry, telephone: (703) 292-4947, email: tmitchel@nsf.gov
- Tingyu Li, Program Director, NSF Chemistry, telephone: (703) 292-4949, email: tli@nsf.gov
- Carol A. Bessel, Program Director, NSF Chemistry, telephone: (703) 292-4906, email: cbessel@nsf.gov
- Timothy Patten, Program Director, NSF Chemistry, telephone: (703) 292-7196, email: tpatten@nsf.gov
- Nora Savage, Nano Team Lead, EPA, telephone: (703) 347-8104, fax: 703-347-8142, email: savage.nora@epa.gov

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

- 47.049 --- Mathematical and Physical Sciences
- 66.509 --- Science To Achieve Results (STAR) Research Program

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 2 to 4

Awards will be funded by either EPA or NSF.

Anticipated Funding Amount: $2,000,000 to $12,000,000

Two to four awards are anticipated in FY 2013 dependant on proposal quality, the availability of funds, and other applicable considerations.

Each award is limited to a maximum of $1,250,000 per year for four years (or $5,000,000 total, including direct and indirect costs).

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

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

PI Limit:

NCCLCs proposals should reflect the research interests of two or more investigators in keeping with the scope of the research activities proposed.

An investigator may participate (as a PI, Co-PI or Senior Personnel) in only one proposal submitted to this competition. The investigator must be affiliated with an eligible organization.

Limit on Number of Proposals per Organization: 1

Only one proposal may be submitted from an eligible entity. If multiple proposals from a single eligible entity are submitted, all proposals from that entity will be returned without review.

Limit on Number of Proposals per PI: 1

An investigator may participate (as a PI, Co-PI or Senior Personnel) in only one proposal submitted to this competition. If an individual is listed as PI, Co-PI or Senior Personnel on multiple proposals, all of the proposals including this individual will be deemed ineligible for the competition and returned without review.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- Letters of Intent: Not Applicable
- Preliminary Proposal Submission: Not Applicable
- 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

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

  March 18, 2013

Proposal Review Information Criteria

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

Award Administration Information

Award Conditions: For NSF-funded awards, standard NSF award conditions apply. For EPA funded awards, see http://www.epa.gov/ncer/EPA_Eligibility_Policy_Reqs/.

Reporting Requirements: For NSF-funded awards, standard NSF reporting requirements apply. For EPA-funded awards, specific reporting requirements are provided at http://www.epa.gov/ncer/EPA_Eligibility_Policy_Reqs/.

TABLE OF CONTENTS

I. INTRODUCTION

Important industrial and manufacturing sectors such as energy, agriculture, plastics, cosmetics, electronics, and pharmaceuticals require the large scale production, transport, and use of chemicals and materials. While these synthetic chemicals or materials are specifically designed to provide tangible benefits when used within the narrow confines of the intended application parameters, it is often difficult to understand or predict the fate and ultimate exposure of these in the complex and linked human-environment systems and across the chemical/material lifecycle. The potential for differential exposure and/or risk to different communities or user groups at different stages of the chemical life cycle further complicates such assessments. The scientific and social literature contains multiple examples of the unintended and potentially detrimental impacts of unanticipated chemical distribution and transformation the environment:

- chloro-fluoro-carbons and depletion of the stratospheric ozone layer: http://greenliving.nationalgeographic.com/freon-really-affect-ozone-20345.html
- endocrine disruption caused by the release of pharmaceuticals in the environment: http://www.epa.gov/endo/
- unanticipated releases of toxic metals in electronics recycling: http://cen.acs.org/articles/89/i31/Taking-Back.html
- unanticipated persistence and bioaccumulation of polybrominated diphenyl ethers (PBDEs) used as flame retardants

As complex and unanticipated changes in chemical/material composition, structure, and reactivity often occur upon interaction with built and natural systems, it is clear that the scientific, technical, and social benefits of synthetic chemicals and materials must be weighed against their potential risk to the environment and public health.

Successful Networks for Characterizing Chemical Life Cycle (NCCLCs) will build the scientific basis and evaluation tools required to understand and predict potential for manufactured chemicals and materials to impact health and the environment across the chemical life cycle. Elucidating key aspects of the chemical/material life cycle as well as the mechanisms associated with important changes in the chemistry and potential risk at each point in the life cycle will require close collaboration from a broad range of scientific disciplines including: chemistry, toxicology, exposure science, engineering, material science, geosciences, mathematics, and computer science.

As more sophisticated compounds are developed, and as societal demands for consideration of potential adverse impacts prior to mass manufacture increase, improved tools and methods are required for generating and/or interpreting information on the critical properties which affect interaction with natural systems. A proactive approach to sustainability requires the in-depth characterization of the synthetic compounds and materials as well as the prediction and/or monitoring of changes within their potential environment, including human health exposure scenarios. To this end, an improved understanding of how interactions with the natural environment impact the reactivity and toxicity of synthetic compounds or materials is key to providing sustainable scientific innovation.

II. PROGRAM DESCRIPTION

This joint EPA/NSF solicitation will create Networks for Characterizing Chemical Life Cycle (NCCLCs) that will address major research challenges related to developing systems and molecular-level understandings of the life cycles of important synthetic chemicals and materials (including nanomaterials) as they are altered by use and interaction with both built and natural environments. These Networks will provide methods and tools for characterizing and predicting environmental and health implications of chemical manufacture and use across the life cycle.

It is envisioned that successful Networks under this solicitation will examine the life cycle of application-based subsets of existing chemicals and materials in the context of intended use within society as well as known negative impacts on health and the environment. These Networks will employ a combination of systems- and molecular-based approaches to identify key aspects of the chemical/material life cycle associated with unintended consequences to human health and the environment and then to predict potential human and environmental exposures and impacts for proposed or emerging chemicals/materials based on generalizable mechanistic insights. NCCLCs will develop approaches for collecting the most useful, reliably- and efficiently-generated data required to anticipate consequences, manage risks, and minimize (or eliminate) potentially harmful impacts - including those for vulnerable populations.

NCCLC teams are expected to be trans-disciplinary, representing the chemical sciences, material science, geosciences, engineering, and public health areas.

Education - Undergraduate and graduate students and postdoctoral fellows should receive systems-based mentoring, education, and training. The participation of underrepresented minorities should be considered at all levels. Workforce development in various aspects of innovation (e.g., intellectual property management and entrepreneurship) is strongly encouraged. Note: 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.

Other educational activities, such as informal science communication (plans for communicating Network research to public audiences and evaluating the impact of these outreach efforts) and the education of K-12 students and/or their teachers, are encouraged.

Innovation - The proposed work should challenge and seek to shift current research, design, or engineering paradigms towards sustainable molecular design and synthesis. Integrative theoretical concepts, approaches, methodologies, instrumentation, or intervention applicable to one or more fields of research are encouraged. Basic research results should be translated or transferred into social or economic benefit. Where appropriate, strategies for innovation should include intellectual property protection and proactive plans to engage industry in technology transfer.

Management - Proposals should include a management plan (maximum 1 page within the Project Description) describing how the Network will be administered and integrated internally. The proposed Network should demonstrate how programmatic and funding decisions will be made; how project objectives will be successfully achieved in a timely manner; and how investigators within the Network will regularly communicate regarding the development, progress, and outcomes of their projects. Networks should also describe plans to monitor and measure progress towards achieving the expected results (outputs and outcomes); discuss who will set priorities; and who will be responsible for implementing the management plan, assuring compliance with the plan, and evaluating its effectiveness in achieving integration within the Network.

Network awards will support teams of principle investigators with shared interests and complementary expertise. The team size and budget should reflect the scope of the problem to be studied. Effective management of the team will include careful evaluation of

research plans and objectives as well as the integration of trans-disciplinary expertise. Plans for the allocation of resources and the promotion of communication throughout the Network and with partners will be considered during proposal evaluations.

It is expected that research teams in the NCCLC awarded under this solicitation will coordinate / communicate with the funded research networks from the EPA/NSF Networks for Sustainable Molecular Design and Synthesis (NSMDS). The researchers working in these two areas will conduct complementary research and will benefit from interaction with each other at annual EPA All Investigator Meetings (also known as progress reviews).

Networks may partner with researchers from industry, national laboratories, and international organizations. Teams are encouraged to develop collaborations that involve sending U.S. students and junior researchers to conduct collaborative research with non-academic partners and to host non-academic researchers for research visits at Network sites. Industrial and government partners should provide a letter of collaboration in the supplementary documents section of the proposal. NCCLCs may also partner with researchers from international organizations. Networks are encouraged to develop collaborations that involve sending U.S. students and junior researchers to conduct collaborative research at international partner organizations. NSF awards are normally limited to support of the U.S. portion of the collaboration. In Network projects funded by NSF where 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 with the NSF OISE program officer(s) responsible for the country(ies) in question (http://www.nsf.gov/od/oise/country-list.jsp.) International partners should provide a letter of collaboration in the supplementary documents section of the proposal. Questions on industrial, federal or international partnerships and their respective budgets should be addressed to the Cognizant Program Officers listed in this solicitation prior to submission.

EPA Specific Goals and Expected Outputs and Outcomes

The specific Strategic Goal and Objective from EPA's FY 2011-2015 Strategic Plan that relate to this solicitation is:

Goal 4: Ensuring the Safety of Chemicals and Preventing Pollution, Objective 4.1: Ensure Chemical Safety.

EPA's FY 2011-2015 Strategic Plan can be found at: http://www.epa.gov/planandbudget/strategicplan.html

Outputs from the research to be funded by EPA may include:

- Reports, presentations and peer-reviewed journal publications discussing development of frameworks, guidance, methodologies and principles for designing sustainable materials throughout their life cycle;
- Tools, metrics, and technologies that enable an accurate assessment of a material through a consideration of its complete life cycle;
- Environmental management methodologies that will provide data for the design of sustainable materials;
- Development of models which would enable impact estimations of novel materials;
- Approaches for collecting the most useful, reliably- and efficiently-generated data required to anticipate consequences, manage risks, and minimize (or eliminate) potentially harmful impacts - including those for vulnerable populations.

Outcomes from the research to be funded by EPA may include:

- Examination of the life cycle of application-based subsets of existing chemicals and materials in the context of intended use within society as well as known negative impacts on health and the environment;
- Incorporation of sustainability principles for chemistry and engineering into chemical design and production;
- Employment of a combination of systems- and molecular-based approaches to identify key aspects of the chemical/material life cycle associated with unintended consequences to human health and the environment and then to predict potential human and environmental exposures and impacts for proposed or emerging chemicals/materials based on generalizable mechanistic insights.

III. AWARD INFORMATION

NSF expects to provide up to $0.5 million per year for four years ($2 million total, for all awards), subject to the availability of funds and the quality of proposals. The NSF anticipates funding up to two awards under this solicitation.

EPA expects to provide up to $2.5 million per year for four years ($10 million total, for all awards) subject to the availability of funds, the quality of proposals received, and other applicable considerations. The EPA anticipates funding up to two awards under this solicitation.

For both NSF and EPA awards: The total amount requested in a proposal submitted for this solicitation may not exceed $5,000,000, including direct and indirect costs. The total project period requested in a proposal submitted for this solicitation may not exceed 4 years. The agencies reserve the right to reject all proposals and make no awards, or make fewer awards than anticipated, under this solicitation. The agencies reserve the right to make additional awards under this solicitation, consistent with agency policy, if additional funding becomes available after the original selections are made. Any additional selections for awards will be made no later than six months after the original selection decisions.

IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

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

- State and local governments and Federally Recognized Indian Tribal Governments.

PI Limit:

NCCLCs proposals should reflect the research interests of two or more investigators in keeping with the scope of the research activities proposed.

An investigator may participate (as a PI, Co-PI or Senior Personnel) in only one proposal submitted to this competition. The investigator must be affiliated with an eligible organization.

Limit on Number of Proposals per Organization: 1

Only one proposal may be submitted from an eligible entity. If multiple proposals from a single eligible entity are submitted, all proposals from that entity will be returned without review.

Limit on Number of Proposals per PI: 1

An investigator may participate (as a PI, Co-PI or Senior Personnel) in only one proposal submitted to this competition. If an individual is listed as PI, Co-PI or Senior Personnel on multiple proposals, all of the proposals including this individual will be deemed ineligible for the competition and returned without review.

Additional Eligibility Info:

Proposals exceeding the funding limits or project period term described herein will be returned without review.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF 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.

Important Proposal Preparation Information: FastLane will check for required sections of the proposal, in accordance with *Grant Proposal Guide* (GPG) instructions described in Chapter II.C.2. The GPG requires submission of: Project Summary; Project Description; References Cited; Biographical Sketch(es); Budget; Budget Justification; Current and Pending Support; Facilities, Equipment & Other Resources; Data Management Plan; and Postdoctoral Mentoring Plan, if applicable. If a required section is missing, FastLane will not accept the proposal.

Please note that the proposal preparation instructions provided in this program solicitation may deviate from the GPG instructions. If the solicitation instructions do not require a GPG-required section to be included in the proposal, insert text or upload a document in that section of the proposal that states, "Not Applicable for this Program Solicitation." Doing so will enable FastLane to accept your proposal.

Linked collaborative proposals are not allowed. All institutionally-collaborative submissions should be submitted as a single proposal with collaborators listed as subawards.

The title of proposals submitted to this competition must begin with "NCCLC: ".

All investigators (PI, Co-PI or Senior Personnel), and their respective institutions, should be listed on the Project Summary page.

Refer to Section II, Program Description, for additional proposal preparation information and instructions.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited

Budget Preparation Instructions:

Required Meetings: Principal Investigators and one associated researcher will be expected to budget for, and participate in, EPA All-Investigators Meetings (also known as progress reviews). These meetings occur once per year in conjunction with EPA / NSF Program Managers/Directors and other grantees to report on research activities and discuss issues of mutual interest. All Investigators Meetings are usually 2-day events held in the Washington, D.C. area.

C. Due Dates

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

  March 18, 2013

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://www.nsf.gov/bfa/dias/policy/meritreview/.

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.

Additional Solicitation Specific Review Criteria

Education - How will undergraduate students, graduate students, and postdoctoral fellows receive systems-based mentoring, education, and training? How well is workforce development and various aspects of innovation (e.g., intellectual property management and entrepreneurship) included in the Network? Will educational activities and outreach efforts to the public or K-12 students and/or their teachers be disseminated broadly? How will the impact of these activities be evaluated?

Innovation - Does the proposed work challenge and seek to shift current research, design, or engineering paradigms? Does the

plan describe innovative theoretical concepts, approaches, methodologies, instrumentation, or interventions applicable to one or more fields of research? Will the research results be translated or transferred into social or economic benefit? Are there adequate strategies for intellectual property protection and plans to engage industry in technology transfer?

Management - Does the management plan adequately describe who will set priorities within the Network and who will be responsible for implementing the management plan, assuring compliance with the plan, and evaluating its effectiveness in achieving integration within the Network? Is the plan for tracking, monitoring, and measuring progress toward achieving expected results (outputs and outcomes) appropriate? Is the plan for ensuring project objectives are successfully achieved in a timely manner realistic? Who is involved in the research and financial decision-making processes and will appropriate mechanisms be utilized and documented? How will the investigators communicate on a regular basis about the development, progress, and outcomes of the Network projects?

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review, and EPA review for EPA-considered proposals as described below.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The EPA and NSF Program Officers assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation. NSF and EPA staff will discuss proposals with overall review scores of Highly Recommend and Recommend to determine which proposals will be considered for NSF funding and which proposals will be considered for EPA funding and subject to the EPA internal programmatic review process described below.

NSF Process:

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.

EPA Process:

For proposals to be further considered for funding by EPA, the principal investigator will be asked to withdraw his/her proposal from NSF and resubmit to EPA according to EPA instructions found at http://www.epa.gov/ncer/EPA_Eligibility_Policy_Reqs/. Proposers will be required to submit additional information and an electronic version of the revised project abstract. They may also be asked to provide responses to comments or suggestions offered by the peer reviewers and/or a revised budget. EPA Project Officers will contact the Principal Investigator to obtain these materials. Before or after an award, proposers may be required to provide additional quality assurance documentation.

EPA final funding decisions are made by the NCER Director based on the results of the peer review and the internal programmatic review and, where applicable, the EPA Human Subjects Research Review Official's (HSRRO) assessment of the applicant's Human Subjects Research Statement (HSRS). In addition, in making the final funding decisions, the NCER Director may also consider program balance and available funds. Applicants selected for funding will be required to provide additional information as requested by EPA. The application will be forwarded to EPA's Grants and Interagency Agreement Management Division for award in accordance with the EPA's procedures.

The official notification of an EPA award will be made by the Agency's Grants and Interagency Agreement Management Division. Applicants are cautioned that only a grants officer is authorized to bind the Government to the expenditure of funds; preliminary selection by the NCER Director in the Office of Research and Development does not guarantee an award will be made. For example, statutory authorization, funding, or other issues discovered during the award process may affect the ability of EPA to make an award to an applicant. The award notice, signed by an EPA grants officer, is the authorizing document and will be provided through electronic or postal mail.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

NSF:

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

NSF:

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.

EPA:

For EPA-funded awards, see http://www.epa.gov/ncer/EPA_Eligibility_Policy_Reqs/

C. Reporting Requirements

NSF:

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.

EPA:

For EPA-funded awards, specific reporting requirements are provided at http://www.epa.gov/ncer/EPA_Eligibility_Policy_Reqs/

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:

- Tyrone D. Mitchell, Program Director, NSF Chemistry, telephone: (703) 292-4947, email: tmitchel@nsf.gov
- Tingyu Li, Program Director, NSF Chemistry, telephone: (703) 292-4949, email: tli@nsf.gov
- Carol A Bessel, Program Director, NSF Chemistry, telephone: (703) 292-4906, email: cbessel@nsf.gov
- Timothy Patten, Program Director, NSF Chemistry, telephone: (703) 292-7196, email: tpatten@nsf.gov
- Nora Savage, Nano Team Lead, EPA, telephone: (703) 347-8104, fax: 703-347-8142, email: savage.nora@epa.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, National Science Foundation Update is a free e-mail subscription service 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 Regional Grants Conferences. Subscribers are informed through e-mail when new publications are issued that match their identified interests. Users can subscribe to this service by clicking the "Get NSF Updates by Email" link on the NSF web site.

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
Division of Administrative Services
National Science Foundation
Arlington, VA 22230

X. APPENDIX

ABOUT THE OFFICE OF RESEARCH AND DEVELOPMENT AND THE ENVIRONMENTAL PROTECTION AGENCY

EPA conducts research that addresses the highest priority science needs of the nation. The work performed by EPA researchers and their grantees and other partners from colleges, universities, and research centers improves the quality of the air we breathe, the water that sustains us, and the land upon which we live. The Office of Research and Development's (ORD) is the scientific research arm of the EPA. ORD's research portfolio is organized into six highly coordinated trans-disciplinary research programs, each aligned around the core of sustainability and guided by input from EPA's partners and stakeholders. These research programs are: Air, Climate, and Energy; Chemical Safety for Sustainability; Human Health Risk Assessment; Homeland Security; Safe and Sustainable Water Resources; and Sustainable and Healthy Communities Research.

EPA's Science to Achieve Results (STAR) Program funds research grants and graduate fellowships in numerous environmental science and engineering disciplines through a competitive solicitation in independent peer review process. The program engages the nation's best scientists and engineers in targeted research that complements EPA's own outstanding intramural research program and those of our partners in other federal agencies. The EPA also supports small business across the nation to develop new technologies to keep the environment clean and healthy through the Small Business Innovation Research (SBIR) Program. The People, Prosperity, and the Planet (P3) Program is a unique undergraduate college student competition for designing solutions for a sustainable future. P3 offers students quality hands-on experience that brings their classroom learning to life.

ORD's continuous support of scientific research paves the way for a healthier future, and for the public and the environment.

To get the latest ORD press releases, twitter feeds and other updates, please visit: http://epa.gov/ord/.

For Frequently Asked Questions: http://www.epa.gov/epahome/faq.htm

Information for funding your research:

STAR Grants: http://www.epa.gov/ncer/rfa/

Fellowships: http://www.epa.gov/ncer/fellow/

Small Business Innovation Research (SBIR) Program: http://www.epa.gov/ncer/sbir/

People, Prosperity, and the Planet (P3) Program: http://www.epa.gov/ncer/p3/

ORD Contact Information

Phone Number: (202) 564-6620

You can send mail to:

US EPA Research
Office of Science Information Management
Mail Drop: D343-04
109 Alexander Drive
Durham, NC 27711