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Harnessing the Data Revolution: Coordination Hub (HDR Central)

PROGRAM SOLICITATION

NSF 20-600



National Science Foundation

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

November 12, 2020

IMPORTANT INFORMATION AND REVISION NOTES

This solicitation is a call for HDR: Coordination Hub (HDR Central) proposals only.

The successful awardee for this solicitation will not be eligible to submit to FY 2021 HDR Institutes for Data-Intensive Research in Science and Engineering (I-DIRSE) competitions.

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

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Harnessing the Data Revolution: Coordination Hub (HDR Central)

Synopsis of Program:

In 2016, the National Science Foundation (NSF) unveiled a set of "Big Ideas," ten bold, long-term research and process ideas that identify areas for future investment at the frontiers of science and engineering (see https://www.nsf.gov/news/special_reports/big_ideas/index.jsp). The Big Ideas represent unique opportunities to position our Nation at the cutting edge of global science and engineering by bringing together diverse disciplinary perspectives to support convergence research. When responding to this solicitation, even though proposals must be submitted through the **Directorate for Computer and Information Science and Engineering, Office of Advanced Cyberinfrastructure, CISE/OAC**, once received, the proposals will be managed by a cross-disciplinary team of NSF Program Directors.

NSF's *Harnessing the Data Revolution (HDR) Big Idea* is a national-scale activity to enable new modes of data-driven discovery that will allow fundamental questions to be asked and answered at the frontiers of science and engineering. In 2019, the HDR Big Idea launched three parallel efforts in pursuit of these aims: Institutes for Data-Intensive Research in Science and Engineering (I-DIRSE), HDR: Transdisciplinary Research In Principles Of Data Science Phase I (HDR TRIPODS Phase I), and Data Science Corps (DSC). To engage participants across these efforts and amplify their impacts, this program solicits proposals for a nationwide HDR Coordination Hub, called HDR Central. The overarching purpose of HDR Central will be to increase the impact of the HDR Big Idea by supporting coordination and communication among all HDR projects, and by sharing HDR efforts and outcomes with the public.

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.

- Amy Walton, telephone: (703) 292-4538, email: HDRCentral@nsf.gov
- Huixia (Judy) Wang, telephone: (703) 292-2279, email: HDRCentral@nsf.gov

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 --- Office of International Science and Engineering
- 47.083 --- Office of Integrative Activities (OIA)

Award Information

Anticipated Type of Award: Cooperative Agreement

Estimated Number of Awards: 1

One award will be made for a maximum duration of five years, subject to the quality of the proposals received and the availability of funds.

Anticipated Funding Amount: \$2,000,000

Up to \$2,000,000, dependent upon the availability of funds.

Eligibility Information

Who May Submit Proposals:

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

Who May Serve as PI:

Principal Investigators (PIs), including co-PIs, on active HDR research awards—I-DIRSE, HDR TRIPODS Phase I, and DSC—**are not eligible** to serve as lead PI or co-PI for this solicitation.

Limit on Number of Proposals per Organization: 1

An organization may serve as the lead institution on only one HDR Central proposal.

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

An individual may serve as PI, co-PI or Senior Personnel on only one HDR Central proposal. **This eligibility constraint will be strictly enforced.** In the event that an individual exceeds the limit, the first proposal received will be accepted based on earliest date and time of proposal submission and the remainder will be returned without review. **No exceptions will be made.**

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposal Submission:** Not required
- **Full Proposals:**
 - Full Proposals submitted via FastLane: *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) guidelines apply. The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.
 - Full Proposals submitted via Research.gov: *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) guidelines apply. The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.
 - Full Proposals submitted via Grants.gov: *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov* guidelines apply (Note: The *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide).

B. Budgetary Information

- **Cost Sharing Requirements:**

Inclusion of voluntary committed cost sharing is prohibited.
- **Indirect Cost (F&A) Limitations:**

Not Applicable
- **Other Budgetary Limitations:**

Not Applicable

C. Due Dates

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

November 12, 2020

Proposal Review Information Criteria

Merit Review Criteria:

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

Award Administration Information

Award Conditions:

Standard NSF award conditions apply.

Reporting Requirements:

Standard NSF reporting requirements apply.

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I. INTRODUCTION

NSF's *Harnessing the Data Revolution (HDR) Big Idea* is a national-scale activity to enable new modes of data-driven discovery that will address fundamental questions at the frontiers of science and engineering. Through this NSF-wide activity, HDR is generating new knowledge and understanding, and accelerating discovery and innovation. The HDR vision is realized through an interrelated set of efforts in foundations of data science; data-intensive research in science and engineering; and education and workforce development. Each of these efforts is designed to amplify the intrinsically multidisciplinary nature of the emerging field of data science. The HDR Big Idea is establishing theoretical, technical, and ethical frameworks that tackle data-intensive problems in science and engineering, contributing to data-driven decision-making that impacts society.

In 2019, the HDR Big Idea launched three parallel efforts in pursuit of these aims:

1. The Institutes for Data-Intensive Research in Science and Engineering (I-DIRSE) activity seeks to create an integrated fabric of interrelated institutes that can accelerate discovery and innovation in multiple areas of data-intensive science and engineering.
2. HDR: Transdisciplinary Research In Principles Of Data Science Phase I (HDR TRIPODS Phase I) aims to bring together the electrical engineering, mathematics, statistics, and theoretical computer science communities to develop the theoretical foundations of data science through integrated research and training activities.
3. Data Science Corps (DSC) focuses on building capacity for HDR to help unleash the power of data in the service of science and society; DSC provides practical experiences, teaches new skills, and offers learning opportunities, in a variety of settings, to data scientists and data science students.

A portfolio of awards in each of these tracks has now formed the beginning of what will become a broad ecosystem for collaboration and synthesis. Interactions among researchers in all three HDR efforts will stimulate convergence among teams that share common scientific themes, and synergies among teams with different skillsets. To maximize and sustain the impacts of the HDR investments, awardees will be further encouraged to leverage resources and engage with collaborators beyond the HDR investments, including leaders of advanced cyberinfrastructure, as well as researchers and educators funded by the other NSF Big Ideas and other NSF science and engineering research activities. NSF recognizes the transformative potential in convergent approaches that bring together researchers with expertise in various science and engineering domains, including data science, to focus on the fundamental challenges of interpreting complex data and maximizing impacts of advanced methods across the breadth of scientific inquiry. The potential for identifying and solving these challenges is the vision behind the HDR ecosystem.

The success of the HDR ecosystem will depend on how effectively teams funded in the different investment areas can interface and leverage their distinct strengths and contributions to address challenging problems in science and engineering. To coordinate these efforts and amplify the impact of HDR activities, this solicitation seeks proposals for an HDR coordination hub, to be called HDR Central.

II. PROGRAM DESCRIPTION

The overarching objectives of HDR Central are to coordinate communication and resource sharing among all HDR-funded projects, broaden the impact of HDR awards across science and engineering research and education, and share HDR efforts and outcomes with the public.

To accomplish these objectives, HDR Central will enhance communication, collaboration and networking within the HDR community and support its expansion; promote national and international visibility of HDR projects, activities, and outcomes; and lead efforts to develop and evaluate metrics for assessing impacts of NSF's HDR activities. **HDR Central will develop and execute plans to meet the above objectives with input from the HDR community.**

In pursuit of the objectives above, HDR Central will perform the following critical functions.

1. **Collaboration and Networking.** The HDR ecosystem concept is founded on the premise that the collective impacts of individual projects will be amplified through interactions among the NSF-funded HDR projects. HDR Central will promote collaboration and networking within the HDR community. It is expected this will be accomplished through a combination of activities (e.g., by organizing and facilitating meetings, workshops, and events) and providing online collaboration spaces and opportunities for HDR PIs and other stakeholders.
2. **Extensive Engagement.** The breadth and persistence of HDR impacts are dependent on the extensibility of the research and data science outcomes generated by the individual awards. HDR Central will coordinate and publicize activities of and for funded HDR projects, extending the benefits to both science and society beyond the participating organizations and targeted communities. Examples of this work include facilitation of research coordination, outreach activities, and activities to broaden the engagement of HDR with the wider science, technology, engineering and mathematics (STEM) communities.
3. **Measuring Impact.** HDR Central will seek to understand and articulate the scientific benefits and broader impacts of the HDR ecosystem. It will work with the HDR community to define metrics for success and promote efforts to enhance impact through community engagement.

III. AWARD INFORMATION

NSF anticipates making one HDR Central award with a maximum duration of five years, contingent on availability of funds and receipt of competitive proposals. Maximum award size is \$2 million. The award will be made as a Cooperative Agreement, with ongoing support contingent upon satisfactory performance as assessed through reviews of annual progress reports.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

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

Who May Serve as PI:

Principal Investigators (PIs), including co-PIs, on active HDR research awards—I-DIRSE, HDR TRIPODS Phase I, and DSC—**are not eligible** to serve as lead PI or co-PI for this solicitation.

Limit on Number of Proposals per Organization: 1

An organization may serve as the lead institution on only one HDR Central proposal.

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

An individual may serve as PI, co-PI or Senior Personnel on only one HDR Central proposal. **This eligibility constraint will be strictly enforced.** In the event that an individual exceeds the limit, the first proposal received will be accepted based on earliest date and time of proposal submission and the remainder will be returned without review. **No exceptions will be made.**

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg. Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.
- Full Proposals submitted via Research.gov: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal and Award Policies and Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg. Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov. The Prepare New Proposal setup will prompt you for the program solicitation number.
- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov*. The complete text of the *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov.

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

Special instructions for submitting to this Big Idea solicitation

FastLane Users: Proposers are reminded to identify the program solicitation number (located on the first page of this document) in the first block on the NSF Cover Sheet. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Please note that even though proposals must be submitted through CISE/OAC, once received the proposals will be managed by a cross-disciplinary team of NSF Program Directors.

Research.gov Users: The Prepare New Proposal setup will prompt you for the program solicitation number (located on the first page of this document). Compliance with this requirement is critical to determining the relevant proposal processing guidelines. As stated previously, even though proposals must be submitted through CISE/OAC, once received the proposals will be managed by a cross-disciplinary team of NSF Program Directors.

Grants.gov Users: The program solicitation number will be pre-populated by Grants.gov on the NSF Grant Application Cover Page, however you will need to locate the Division Code, Program Code, Division Name, and Program Name for the specific solicitation you are applying to by visiting <https://www.fastlane.nsf.gov/pgmannounce.jsp>. As stated previously, even though proposals must be submitted through CISE/OAC, once received the proposals will be managed by a cross-disciplinary team of NSF Program Directors.

Efforts that involve multiple organizations must be submitted as a single, integrated proposal by the lead organization, with proposed subawards to the other partner organizations. Separate proposals from each partner will not be accepted. See PAPPG Chapter II.3.a.

The following instructions supplement guidelines in the PAPPG and NSF Grants.gov Application Guide:

Title of Proposed Project: The title of the proposed project should begin with the term: "HDR Central:"

Project Description. The Project Description is limited to 15 pages and must comply with all formatting requirements of the most current PAPPG II.C.2.d. In addition to the requirements outlined in the NSF PAPPG, proposals must address the following elements in the 15-page project description:

- First, provide a clear and concise overview of the HDR Central project's goals and proposed activities.
- **Collaboration and networking:** Proposals should describe specific, measurable collaboration and networking goals HDR Central will accomplish, annually and over the duration of the award, and detail the strategies for achieving these goals. Proposers are expected to use a mixture of virtual and in-person convening activities and utilize online platforms, tools, and resources to facilitate collaboration, networking, and sharing of best practices within the HDR ecosystem. Proposals must provide compelling evidence that the proposed project team has the requisite skills and experience to execute the proposed collaboration and networking strategies.
- **Extensive Engagement:** Proposals should describe the approach(es) that will be employed to enhance impact of HDR awards through community engagement and extend the benefits to both science and society beyond the participating organizations and targeted communities. Proposals should describe plans for HDR Central to work both collaboratively with awardees and independently to achieve specific communication goals. In doing so, proposers should specify: the audiences that will be the focus of HDR Central's communication activities; the goals of proposed communication activities; the strategies that will be employed to synthesize and identify important emergent results of HDR awardees' work; and the methods and channels that will be employed to share key messages and information with specific target audiences. Proposals must provide compelling evidence that the proposed project team has the requisite skills and experience to execute the proposed communication strategies. In addition, the PI should describe how HDR Central will maintain connections with the outreach and broadening participation activities of HDR projects as well as with NSF's broadening participation efforts.
- **Measuring the impacts and success of the HDR ecosystem:** Proposals should describe the approach(es) that will be employed to identify, in collaboration with awardees and with input from the HDR community, key metrics for documenting and assessing outputs, outcomes and impacts of the HDR program. Proposals should describe strategies for supporting awardees in utilizing lessons learned, best practices, and common metrics to assess and report on outcomes of their work. PIs should describe the metrics they will employ and steps they will take to monitor progress towards the achievement of stated goals. This description should also include plans for assessing the impacts of HDR Central's activities in support of these goals.

Supplementary Documents: Supplementary documents listed in the PAPPG or NSF Grants.gov Application Guide as required should be appended in the Supplementary Document section.

Management and Coordination Plan (3-page limit, to be submitted as a Supplementary Document): Proposal must contain a clearly labeled "Management and Coordination Plan", which includes: 1) the specific roles of the PI, co-PIs, other senior personnel, and paid consultants at all organizations involved; 2) how the project will be managed across organizations and disciplines; 3) identification of the specific coordination mechanisms that will enable cross-organization and/or

cross-disciplinary scientific integration (e.g., yearly workshops, graduate student exchanges, project meetings at conferences, use of videoconferences, use of common resources, etc.); 4) a schedule of activities; and 5) pointers to the budget line items that support these management and coordination mechanisms.

List of Project Personnel and Partner Organizations: Provide current, accurate information for all personnel and organizations involved in the project. The list must include all PIs, co-PIs, Senior Personnel, paid/unpaid Consultants or Collaborators, Subawardees, Postdocs, project-level advisory committee members, and writers of letters of collaboration. This list should be numbered and include (in this order) Full name, Organization(s), and Role in the project, with each item separated by a semi-colon. Each person listed should start a new numbered line. For example:

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

Data Management Plan: Proposals must include a Supplementary Document of no more than two pages labeled "Data Management Plan." This supplementary document should describe how the proposal will conform to NSF policy on the dissemination and sharing of project results. See Chapter II.C.2.j of the PAPPG for full policy implementation. For additional information on the Dissemination and Sharing of Research Results, see: <https://www.nsf.gov/bfa/dias/policy/dmp.jsp>. For specific guidance for Data Management Plans please consult <https://www.nsf.gov/bfa/dias/policy/dmp.jsp>.

Postdoctoral Researcher Mentoring Plan: Each proposal that requests funding to support postdoctoral researchers must upload under "Mentoring Plan" in the supplementary documentation section of FastLane, a description of the mentoring activities that will be provided for such individuals. Mentoring activities provided to postdoctoral researchers supported on the project will be evaluated under the Broader Impacts review criterion. For additional information regarding postdoctoral researcher mentoring plans, see Chapter II.C.2.j of the PAPPG.

Single-Copy Documents:

Collaborators & Other Affiliations Information: Proposers should follow the guidance specified in Chapter II.C.1.e of the [NSF PAPPG](#).

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Budget Preparation Instructions:

The budget may include a request for funds to cover the cost of attendance of the Principal Investigator and other HDR Central personnel to participate in annual awardee meetings in the Washington, D.C. area.

C. Due Dates

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

November 12, 2020

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

For Proposals Submitted Via FastLane or Research.gov:

To prepare and submit a proposal via FastLane, see detailed technical instructions available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. To prepare and submit a proposal via Research.gov, see detailed technical instructions available at: https://www.research.gov/research-portal/appmanager/base/desktop?_nfpb=true&_pageLabel=research_node_display&_nodePath=/researchGov/Service/Desktop/ProposalPreparationandSubmission.html. For FastLane or Research.gov user support, call the FastLane and Research.gov Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov or rgov@nsf.gov. The FastLane and Research.gov Help Desk answers general technical questions related to the use of the FastLane and Research.gov systems. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

For Proposals Submitted Via Grants.gov:

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: <https://www.grants.gov/web/grants/applicants.html>. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

Proposers that submitted via FastLane or Research.gov may use Research.gov to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application

on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

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

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

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

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

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

A. Merit Review Principles and Criteria

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

1. Merit Review Principles

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

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

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

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

2. Merit Review Criteria

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

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

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

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

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

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

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

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

Additional Solicitation Specific Review Criteria

In addition to the NSF Merit Review Criteria, reviewers will be asked to consider the ability of the proposed HDR Central project to achieve the goals and fulfill the three critical functions articulated in the Project Description section above. Questions to be considered include:

- **Collaboration and Networking:**
 - To what extent does the proposal include a compelling strategy for promoting collaboration and networking within the HDR ecosystem utilizing an appropriate mix of convening in-person and online collaboration activities?
 - Does the proposal include an appropriate plan for generating evidence on the efficacy and effectiveness of its collaboration and networking strategies and plans?
- **Extensive Engagement:**
 - To what extent does the proposal include well-articulated and sound communication strategies for disseminating information about, and synthesizing, highlighting, and sharing outcomes of, HDR projects and activities with key target audiences?
 - Does the proposal articulate a comprehensive, feasible plan for maintaining appropriate connections among HDR projects' outreach and broadening participation activities, and extending the benefits to both science and society beyond the participating organizations and targeted communities?
 - Does the proposal include an appropriate plan for generating evidence on the efficacy and effectiveness of its engagement strategies and plans?
- **Measuring Impact:**
 - To what extent does the proposal provide a plan for incorporating lessons learned and best practices, and utilizing extant and/or developing new metrics for assessing the impacts of NSF's HDR initiatives?
 - Does the plan provide opportunities for the HDR community to contribute to the selection/development of metrics as appropriate?
 - Does the proposal provide compelling evidence that the members of the proposed project team possess the skills and expertise necessary to oversee the selection, development and application of metrics to assess and report on HDR outcomes and impacts?

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 evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will generally be completed and submitted by each reviewer and/or panel. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF strives to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

After programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications. After an administrative review has occurred, Grants and Agreements Officers perform the processing and

issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

Once an award or declination decision has been made, Principal Investigators are provided feedback about their proposals. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers or any reviewer-identifying information, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award notice, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award notice; (4) the applicable award conditions, such as Grant General Conditions (GC-1)*; or Research Terms and Conditions* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award notice. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at https://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the NSF *Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

Programmatic Terms and Conditions:

The HDR Central award will be made in the form of a Cooperative Agreement. The Cooperative Agreement will have a section of Special Conditions relating to the period of performance, detailed work description, awardee responsibilities, NSF responsibilities, joint NSF awardee responsibilities, funding and funding schedule, reporting and evaluation requirements, key personnel, and other conditions. NSF will provide general oversight and monitoring of HDR Central to help assure effective performance and administration, as well as facilitating any coordination necessary to further the objectives of the Harnessing the Data Revolution (HDR) Big Idea. To provide oversight, the NSF Program Director and a site visit team will review the Hub at least once during the course of the award.

Large awards with complex workplans may be required to complete a Project Execution Plan (PEP) with additional details on scope of work, schedule, costs, and project management. In addition, these projects may be required to provide further documentation on cost estimates. Where this is applicable, the program officer will notify the PI and provide the necessary templates and guidelines for creating the required documents. These documents must be completed prior to a final recommendation being made but are not required at time of submission. If awarded, PIs will be expected to address progress on PEP task items in their annual reports.

Grantees will be required to include appropriate acknowledgment of NSF support under the HDR Big Idea in any publication (including World Wide Web pages) of any material based on or developed under the project, in the following terms:

"This material is based upon work supported by the National Science Foundation HDR Big Idea under Grant No. (Grantee enters NSF grant number.)

Grantees also will be required to orally acknowledge NSF support using the language specified above during all news media interviews, including popular media such as radio, television and news magazines.

The successful awardee for this solicitation will not be eligible to submit to FY21 HDR I-DIRSE competitions.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer no later than 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). No later than 120 days following expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

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

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

More comprehensive information on NSF Reporting Requirements and other important information on the administration of NSF awards is contained in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

VIII. AGENCY CONTACTS

Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.

General inquiries regarding this program should be made to:

- Amy Walton, telephone: (703) 292-4538, email: HDRCentral@nsf.gov
- Huixia (Judy) Wang, telephone: (703)292-2279, email: HDRCentral@nsf.gov

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

- FastLane and Research.gov Help Desk: 1-800-673-6188
FastLane Help Desk e-mail: fastlane@nsf.gov.
Research.gov Help Desk e-mail: rgov@nsf.gov

For questions relating to Grants.gov contact:

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

IX. OTHER INFORMATION

The NSF website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this website by potential proposers is strongly encouraged. In addition, "NSF Update" is an information-delivery system designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF [Grants Conferences](#). Subscribers are informed through e-mail or the user's Web browser each time new publications are issued that match their identified interests. "NSF Update" also is available on [NSF's website](#).

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

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 (FASSED) provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See the *NSF Proposal & Award Policies & Procedures Guide* Chapter II.E.6 for instructions regarding preparation of these types of proposals.

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

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

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

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

- **Location:** 2415 Eisenhower Avenue, Alexandria, VA 22314
- **For General Information** (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) 292-8569
- **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 [System of Record Notices](#), NSF-50, "Principal Investigator/Proposal File and Associated Records," and NSF-51, "Reviewer/Proposal File and Associated Records." Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

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

Suzanne H. Plimpton
Reports Clearance Officer
Office of the General Counsel
National Science Foundation
Alexandria, VA 22314

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