NSF Convergence Accelerator Phase I and II

PROGRAM SOLICITATION
NSF 20-565

National Science Foundation

Office of Integrative Activities

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

May 11, 2020

Phase I Preliminary Proposal

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

July 10, 2020

Phase I Full Proposals, by invitation only

May 17, 2021

Phase II Full Proposals, only Phase I awardees are eligible

IMPORTANT INFORMATION AND REVISION NOTES

The NSF Convergence Accelerator is an NSF-wide program, initially launched in Dear Colleague Letter NSF 19-050. For this solicitation,

- Phase I proposers must first submit a required preliminary proposal.
- Proposers must receive an invitation to submit a Phase I full proposal.
- Phase I projects awarded through this solicitation will be grants. All Phase II proposals must be built upon a foundation developed by one or more Phase I awards. Additionally:
  - At least one Principal Investigator or co-Principal Investigator from a Phase I award must be included as a PI or co-PI on a Phase II proposal.
  - Only one Phase II proposal is permitted from each Phase I team.
  - The Phase I grantee does not have to be the proposing organization for the Phase II proposal, nor does the same individual have to be the PI. Any change of proposing institution or PI should be fully explained in the proposal.
  - Proposers should describe the way(s) in which they plan to collaborate with other Phase I team(s). These collaborations may be supported via sub-awards. However, "collaborative" proposals, meaning simultaneous submission of proposals from different organizations, with each organization requesting a separate award, are NOT permitted. If teams choose to create a fully integrated, single effort, only one proposal may be submitted.
  - Phase II awards will be cooperative agreements to allow NSF to work more directly with teams to enable delivery of tangible research products identified in Phase I.

The submitted Phase I preliminary proposals will be reviewed by Ad Hoc Review and/or Panel Review. Invited Phase I full proposals will also be reviewed by Ad Hoc Review and/or Panel Review.

Phase II proposals submitted in response to this program solicitation will be reviewed by Ad Hoc Review and/or Panel Review, and in addition will be invited to participate in an in-person presentation (pitch) to a panel of experts. Promoting partnerships is one of NSF's core strategies and can enhance research productivity and impacts. The Convergence Accelerator seeks to engage with a range of potential stakeholders. External stakeholders including industry, foundations, other federal government agencies, state or local governments, and members of potential investment communities will be invited to attend the pitch competition described in section VI. Any organization or individual that seeks to attend the pitch competition should contact the Cognizant Program Officers listed below

Preliminary Proposals submitted in response to this solicitation should be submitted in accordance with the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 19-1).

Full Proposals submitted in response to this solicitation should be submitted in accordance with the revised 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:

NSF Convergence Accelerator Phase I and II

Synopsis of Program:

The goals of NSF's convergence accelerator effort are to support and accelerate use-inspired convergence research in areas of national importance within particular topics (tracks). NSF Convergence Accelerator tracks can be related to Industries of the Future (IotF), NSF's Big Ideas, or other topics, that may not relate directly to an IotF or Big Idea, however, they must have the potential for significant national impact.

The 2020 NSF Convergence Accelerator is a two-phase program. Both phases are described in this solicitation. Phase I awardees receive significant resources to further develop their convergence research ideas and identify crucial partnerships and resources to accelerate their projects, leading to deliverable research prototypes in Phase II.

This solicitation invites proposals for the following Tracks:

Quantum Technology (Track C)

AI-Driven Innovation via Data and Model Sharing (Track D)

The NSF Convergence Accelerator leverages fundamental research leading to rapid advances that can deliver significant societal impact. Proposers must first submit a Phase i preliminary proposal in order to be invited to submit a full Phase I proposal. The information required in the preliminary proposal is described in section V.

Phase I proposals must describe a team, or a process to build a team, that includes personnel with the appropriate mix of disciplinary and institutional expertise needed to build a Phase II convergence research effort. Phase I proposals must describe one or more deliverables and how those research outputs could impact society by the end of Phase II. Phase I proposals should describe the deliverable and the research plan and team formation efforts that will refine it to a proof-of-concept. Phase I will include NSF-organized convenings for training and intra- and cross-cohort collaboration. Phase I awards are expected to be for up to 9 months and up to $1M each.

Only awardees of Phase I grants under this solicitation may submit a Phase II proposal. Phase II proposers must outline a two-year research and development plan in which research transitions to practice through collaboration with end-users.

Phase II proposals must describe clear deliverables that will be produced in two years of effort and the metrics by which impacts will be assessed. The Phase II teams must include appropriate stakeholders (e.g., industry, Institutions of Higher Education (IHEs), non-profits, government entities, and others), each with a specific role(s) in facilitating the transition of research outputs into practical uses. Successful proposals will be funded initially for one year. Each team's progress will be assessed during the year through approximately six virtual and in-person meetings with NSF program staff. The overall progress will be evaluated at the end of one year, based on a report and presentation that the team will make to a panel of reviewers. Teams that show significant progress during the first year, in accordance with the agreed timetable of milestones and deliverables, will receive funding for a second year. Teams should plan on completing the effort within two years; no-cost extensions will be authorized only in extraordinary circumstances.

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.

- Linda Molnar, telephone: (703) 292-8316, email: lmolnar@nsf.gov

- Lara A. Campbell, telephone: (703) 292-7049, email: lcampbel@nsf.gov

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

- 47.083 --- Office of Integrative Activities (OIA)

Award Information

Anticipated Type of Award: Standard Grant or Cooperative Agreement

Estimated Number of Awards: 1 to 40

30 Phase I Awards

10 Phase II Awards

Anticipated Funding Amount: $30,000,000

Anticipated funding is $30,000,000, pending availability of funds, to support Phase I awards in FY2020. Proposers may request up to $1M for Phase I.

The total amount awarded in future years will depend on the availability of funds and the number of awards advancing to Phase II awards. Phase II proposals may request up to $3,000,000 for year 1 and up to $5,000,000 in total for the two-year Phase II project.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

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

Who May Serve as PI:

The PI and any co-PIs must hold an appointment at an organization that is eligible to submit as described under "Who May Submit Proposals." At least one PI or co-PI from a Phase I award must be included as a PI or co-PI on a Phase II proposal. The same individual who served as PI for the Phase I award does not have to be PI for the Phase II proposal. Any change of PI and co-PI should be fully explained in the proposal.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

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

There are no restrictions or limits.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required

- **Preliminary Proposals:** Submission of Preliminary Proposals is required. Please see the full text of this solicitation for further information.

- **Full Proposals:**

    - Full Proposals submitted via FastLane: *NSF Proposal and Award Policies and Procedures Guide* (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:**

    Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

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

    May 11, 2020

    > Phase I Preliminary Proposal

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

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    > Phase I Full Proposals, by invitation only

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    > Phase II Full Proposals, only Phase I awardees are eligible

Proposal Review Information Criteria

Merit Review Criteria:

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

Award Administration Information

Award Conditions:

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

Reporting Requirements:

Standard NSF reporting requirements apply.

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I. INTRODUCTION

The NSF Convergence Accelerator promotes use-inspired, convergence research in areas of national importance via partnerships between academic and non-academic stakeholders. In this Phase I and Phase II solicitation of the NSF Convergence Accelerator, NSF seeks to support and facilitate research that advances ideas from concept to deliverables in two overall convergence topics (tracks).

The 2020 NSF Convergence Accelerator consists of two tracks as follows:

Quantum Technology (Track C)

AI-Driven Innovation via Data and Model Sharing (Track D)

Convergence Research is a critical mechanism for solving many vexing research problems, especially those stemming from complex societal and/or scientific challenges. The NSF Convergence Accelerator seeks to support use-inspired research and enable the accelerated transition of that research into benefits for society through a two-phase process. Phase I teams will participate in the Convergence Accelerator curriculum, which pushes them to identify and expand partnerships with end-users, other stakeholders, and other teams, allowing them to refine their plans for Phase II.

Phase II proposals build upon the Phase I experience, describing the research and development efforts that the convergence research teams will undertake to produce deliverables that transition effectively to benefits for the American people.

The NSF Convergence Accelerator program is committed to research and development that derives expertise from and provides broad benefits to a diverse public. The program encourages proposals from, and partnerships with, minority-serving institutions (e.g., HBCUs, Tribal Colleges, Hispanic Serving Institutions, Alaska Native-Serving Institutions, and Native Hawaiian-Serving Institutions), and other organizations that reflect, support, and include a diverse public (e.g., in terms of demographics and regions).

II. PROGRAM DESCRIPTION

This NSF Convergence Accelerator Phase I and Phase II solicitation seeks to address topics described in the convergence tracks identified above and detailed below. Phase I awards are grants for planning and preliminary prototyping. Phase I awards leverage basic research investments. Phase II awards are cooperative agreements that build upon the Phase I efforts, leading to rapid research advances that deliver useful results to society.

The guiding rationale of the NSF Convergence Accelerator is that a high level of interdisciplinarity and engagement with multiple kinds of stakeholders, including

researchers and the ultimate users of research products, is essential to deliver progress on scientific challenges of societal relevance — such as those embodied by the two tracks in this solicitation. Successful NSF Convergence Accelerator Phase II proposals are expected to have four important characteristics: 1) convergence research approach; 2) a strong, multi-organization partnership involving researchers, users, and other stakeholders; 3) high probability of successful deliverables *within a two-year period* that will ultimately benefit society, and 4) strong alignment with the track goals as described in this solicitation.

TRACKS

Quantum Technology (Track C)

The Committee on Science of the National Science and Technology Council has identified Quantum Information Science as the way for the United States to improve its industrial base, create jobs, and provide economic and national security benefits [1]. The report states that developments in QIS underpin significant parts of the national economic and defense infrastructure. Future scientific and technological discoveries from QIS will be even more impactful. The national effort is focused on a science-first approach to identify and solve grand challenges to enable transformative scientific and industrial progress, build a quantum smart and diverse workforce, and lock in industry engagement as part of the key infrastructure to realize the scientific and technological opportunities. This Convergence Accelerator track complements NSF's *Quantum Leap* effort, which is one of NSF's Big Ideas. Efforts in this track seek deliverables that will benefit society, including and beyond scientific communities, within a two-year research and development effort.

Teams supported through the Quantum Technology track are expected to interact synergistically and leverage resources available through institute-level investments made by NSF in response to the National Quantum Initiative [2], such as the Quantum Leap Challenge Institutes. The Quantum Technology track will leverage recent advances in quantum information science research focused on the development and operation of Noisy Intermediate-Scale Quantum (NISQ) architectures, quantum sensors (QSen), and or quantum interconnects (QuIC). Projects supported through this track should describe how they will bridge the gap between state-of-the-art fundamental research generating lab proof of concept architectures, devices, and theories and current industry efforts to build a universal quantum computer. NSF is interested in teams that establish partnerships between academia and industry to create convergent, trans-sector approaches for diverse workforce development.

Advances in this nascent interdisciplinary field already involve teams forming across quantum theory, physical sciences, computer science, and engineering. Truly convergent research employing a use-inspired approach will require teams that merge quantum science, engineering, and computing with experts from the broader research community as dictated by use, and that blends approaches that consider the technological impact on the economy, the workforce, human behavior, and society at large. Potential 'use' areas could be driven by sectors such as: Biotechnology, Ecology, Environmental Science and Engineering, Astronomy, Aerospace, and Medicine. Furthermore, potential core partners should include diverse researchers or experts from social and behavioral sciences, art, law, and or education. In order to ensure US leadership in QIS, NSF is interested in cohorts of researchers that, for example, address environmental impact as part of the development of next generation technology. From the Industrial Revolution through to IoT and the Big Data age, workers have had to adapt or be left behind. As we look forward to the Quantum Leap and in keeping with NSF's mission to educate, train and fuel the scientific pipeline to advance the ability of the Nation to meet current and future challenges, preparing the quantum workforce and the quantum ecosystem at all levels of our society is a need that convergence research can address.

Convergence Research in Quantum Technology

Second generation quantum information devices that harness the potential of quantum entanglement must be interconnected to be useful in real world applications. For example, quantum processors will need to be interconnected to scale up processing power, and quantum sensors need to be interconnected to overcome standard quantum limits. The recent NSF "Quantum Interconnect" Convergence Accelerator workshop [3] identified several important areas in which meaningful progress can be made in the next several years toward developing practical, commercially viable quantum connection technologies to avoid delays when quantum information systems are ready for deployment. To accelerate the progression from laboratory concepts to practical applications, NSF invites proposals that will result in the development of Quantum Interconnect (QuIC) prototypes to enable critical functionality needed across a broad range of transmission applications in quantum information systems or to enable critical connectivity of multiple NISQ processors for scaling up quantum computing and quantum simulation applications to solve problems of societal relevance. Proposals should describe efforts that enable connectivity at any scale. Proposals may address short range connections between multiple NISQ processors for scaling up of quantum computing and quantum simulation applications, could address long-range connections needed to transmit quantum data over meter to kilometer distances, and could focus on critical time or frequency conversion factors relevant to quantum connectivity of disparate platforms.

NSF invites proposals that outline novel Quantum Simulation (QSim) approaches that can address societal needs and can be implemented/co-designed on single- or multiple-processor NISQ processors, quantum sensors that benefit from an arrayed architecture, or communication nodes that enable fully secure communication. The recent NSF "Quantum Simulation" Convergence Accelerator workshop [4] highlighted opportunities for first practical applications of quantum machines ranging from highly optimized special purpose simulators to flexible programmable devices. Proposals may address quantum simulator prototypes usable by broader technical communities, complementary to the present "universal quantum computer" efforts, or could address use-directed research carried out by a blend of multi-investigator, multi-disciplinary teams developing resources for quantum simulator software, hardware, and education. Track C teams have the opportunity to partner with company stake-holders to, for example, build a quantum ecosystem that is not intrinsically quantum in itself.

NSF invites proposals that demonstrate new fabrication and control strategies to translate ordered nanocrystal architectures into quantum sensors (QSen) and use-inspired devices. Proposals will show, for example, the controlled assembly of multifunctional nanocrystal architectures and semiconductor nanoparticles that use the concepts of quantum mechanics to achieve orders of magnitude advancement in precision (both from a theoretical and experimental point of view). Expected deliverables could include the production of a use-inspired high-performance optoelectronic device and modeling frameworks to guide quantum sensor development amenable to scalable nanomanufacturing practices. Given the use-inspired nature of the program, leveraging or directly connecting with federal centers (for example, Department of Energy EFRCs - Energy Frontier Research Centers) or federal facilities is encouraged. Track C teams will focus on QSen materials, their sensitivities, and metrologies of interest to one or more communities in academia, industry, government, non-profits, and others, and on identifying the supporting ecosystem and infrastructure for transitioning such modalities into practice.

To accelerate the scaling of NISQ-era quantum computers to 1000 qubits or more, NSF invites proposals that will result in the rapid increase of the number of connected qubits from the current state-of-the-art across all viable quantum computing implementations. Advances are desired in: (1) eliminating scaling bottlenecks leading to an increase by 10x in the number of qubits; (2) novel error-correction algorithms; and/or (3) creation of efficient software toolchains that can bridge the gap between quantum algorithms and hardware. This call is motivated by the recent progress in the development of early quantum computing implementations with less than 100 qubits in the NISQ regime, and the realization that scaling of NISQ-regime quantum computers to 1000 qubits or more is essential in order to achieve the quantum advantage required by most practical applications. Along those lines, the recent NSF Convergence Accelerator workshop on Scalable Quantum Computing (SQC) systems [5] highlighted opportunities to co-design full-stack quantum computer systems along with their applications in order the accelerate progress towards first practical quantum computing applications.

NSF invites proposals from teams that establish partnerships between academia and industry to create convergent, trans-sector approaches to education research and development to prepare and support a diverse workforce. Creating a quantum smart and diverse workforce is a national priority. Educating students and training workers in convergent science is a challenge, especially in new fields such as quantum information science that are radically different from

previous approaches. Co-training students in the social sciences and quantum technology so that societal, behavioral, and economic impact can be anticipated and ameliorated is also a great challenge. Traditional pedagogical approaches to sequential interdisciplinary learning are limiting and could be accelerated through novel hybrid platforms. If quantum information science holds the key for solving grand challenges and engendering technological innovation, then it is critical that education and training platforms evolve to i) accelerate preparation of domain expert scientists to leverage the impending quantum leap, ii) support learners and educators in anticipation of the future quantum workforce, and iii) create a next generation quantum learning ecosystem including educational institutions, professional societies and non-profits, large companies, startups, and small businesses. In addition, invited proposals may include research for workforce development at the intersections of the quantum information science and the Future of Work at the Human-Technology Frontier.

AI-Driven Innovation via Data and Model Sharing (Track D)

Leadership in Artificial Intelligence (AI) is a key Administration R&D priority. In 2019, the American Artificial Intelligence Initiative launched a national approach for AI leadership in ensuring that AI research benefits society. Convergent research will be required to develop shared public datasets that simultaneously preserves the safety and security of AI systems and addresses the ethical, legal, and societal implications of AI. The *National AI R&D Strategic Plan* emphasizes the urgency in developing and making accessible a wide variety of datasets to meet the needs of a diverse spectrum of AI interests and applications while dealing with associated challenges; making training and testing resources responsive to commercial and public interests; and, developing open-source software libraries and toolkits to enable data sharing and access [6]. This Convergence Accelerator track complements NSF's *Harnessing the Data Revolution* effort, which is one of NSF's Big Ideas. This track seeks multidisciplinary, use-inspired, research projects leading to the development of a *ModelCommons*—for sharing data and data-driven models, for open as well as sensitive data and data-driven models.

Teams supported through this AI-Driven Innovation track should describe how they would bridge the gap between the state-of-the-art in fundamental research (for example, supported through existing NSF programs, such as the Secure and Trustworthy Cyberspace, Fairness in Artificial Intelligence, and others) and current practice in platforms and protocols for data/model sharing, including dealing with issues such as privacy, ethics, fairness, and bias. Projects should describe deliverables that will benefit society, including and beyond scientific communities, that could be expected within a 2-year research effort.

Track D projects will have *data-centric* as well as *model-centric* aspects. The *data-centric* aspect would focus on substantial datasets of interest and of importance to one or more communities in academia, industry, government, non-profits, and or others, and on the tools, platforms, and protocols for making such data shareable and "AI-ready". Projects must provide specific examples of the types of AI algorithms and or applications that would be the intended use for these data. Project activities will include tools, platforms, or protocols for data preprocessing and preparation, including providing unique identifiers for data and metadata to make data FAIR (Findable, Accessible, Interoperable, Reusable); development of metadata and context information; and sanitization and encryption of sensitive data. The *model-centric* aspect would focus on issues such as annotation and sharing of data-driven models; providing lineage and provenance information for models; providing appropriate contextual information to enable reuse; and supporting reproducibility via a *ModelCommons* mechanism.

All Track D projects are expected to describe the implementation platform(s) to be used for data or model sharing. Projects are encouraged to consider the use of public clouds, for example, using the NSF-funded CloudBank (cloudbank.org) as a mechanism for acquiring cloud resources. Teams will consider opportunities for cross-disciplinary training and teaching as an integral part of the effort, using the data and/or data-driven models that are the targets of the project. Prospective teams are encouraged to consider related efforts underway in both academia and industry, such as https://onnx.ai/, https://paperswithcode.com/, and https://coleridgeinitiative.org/, which is developing a scalable ecosystem for sharing sensitive industry or human subjects data, together with hundreds of federal, state, and local organizations. Projects should assess and strive to leverage such efforts and or expand upon them where possible.

Convergence Research in AI-Driven Innovation

NSF invites teams to develop tools, platforms, protocols for curation and sharing of open as well as sensitive protected data and data-driven models to enable robust and transparent research and experimentation in use-inspired AI. Projects will identify specific datasets, and or collections of heterogeneous datasets, and potential AI applications based on those data. The AI-driven innovation should have the potential to lead to new discoveries and research results as well as to new educational opportunities where domain scientists could learn about new data science methods and data scientists could learn about new data types, as described in the report from the NSF workshop on *Network for Earth-space Research Education and Innovation with Data (NEREID)* [7].

NSF invites proposals that will develop techniques and services for dealing with issues related to sensitive data, privacy, and data sanitization. The report from the NSF workshop on *Future of Privacy Technology* identified many areas of scientific inquiry where researchers could advance their work with access to sensitive and proprietary data [8]. The privacy methods employed must remain sufficiently explainable and transparent to help researchers correct them and make them safe, efficient, and accurate. Secure multi-party computation and distributed ML techniques are being developed to operate on secure, distributed data enclaves. What are effective structures, protocols, and processes for oversight and governance in these types of situations? What is required to create a community-level secure data sharing service/facility? A number of data preprocessing techniques (e.g., data cleaning, integration, transformation, reduction, and representation) may be needed to establish useful datasets for AI applications. Sensitivity and privacy of data can be context dependent, potentially leading to different implications in different contexts. While privacy is a serious concern in commercial and government data, it can be an important issue in scientific data as well. Data owners often assume a risk when sharing their data for downstream use/reuse. Convergence in use-driven AI could reveal discoveries beyond the original or intended scope; therefore, researchers must remain cognizant of the potential dangers in access to data.

NSF invites teams to address ethics, fairness, and bias issues, recognizing that there are some gaps between the state-of-the-art in research and the current state of common practice in these areas. Track D projects have the opportunity to work with companies and government data holders to, for example, help install ethical data review processes; establish frameworks for dealing with potential bias and discrimination; deal with issues in the use of incomplete or selective data and misuse of data. Efforts are needed in the basic design of data sharing systems and processes and use of appropriate state-of-the-art analytical tools to address fairness and equity issues associated with datasets.

REFERENCES

1. "National Strategic Overview for Quantum Information Science", https://www.quantum.gov/wp-content/uploads/2020/10/2018_NSTC_National_Strategic_Overview_QIS.pdf
2. "National Quantum Initiative Act", https://www.congress.gov/bill/115th-congress/house-bill/6227/text
3. "Development of Quantum InterConnects for Next-Generation Information Technologies", arXiv:1912.06642 [quant-ph]
4. "Quantum Simulators: Architectures and Opportunities", arXiv:1912.06938 [quant-ph]
5. "Scalable Quantum Computing Systems", https://arxiv.org/abs/1912.07577
6. The National AI R&D Strategic Plan: 2019 Update, https://www.nitrd.gov/pubs/National-AI-RD-Strategy-2019.pdf, June 2019.
7. Network for Earth-space Research Education and Innovation with Data (NEREID) NSF Workshop Report, November 2019, https://drive.google.com/file/d/1SJ9oCqnYa6gC3GLjAcLvpBuaffVllQEb/view?usp=sharing.
8. Future of Privacy NSF Workshop Report, August 2019, https://fpf.org/wp-content/uploads/2020/03/NSF_FPF-REPORT_C-Accel1939288_Public.pdf.

KEY COMPONENTS OF THE NSF CONVERGENCE ACCELERATOR

Phase I preliminary proposals, Phase I full proposals, and Phase II proposals must address the following key components with increasing levels of detail. See section V, solicitation specific review criteria for more detail.

Convergence Research

Research and development efforts proposed should represent the highest level of interdisciplinary expertise needed to approach the full scope of the topic selected. Because transition to practice is a core goal of the convergence accelerator, this should include personnel with expertise relevant to applications and use as well as technologies. Engagement with the physical sciences, math, engineering, data and computer sciences are obvious for most topics, but proposers should also include at the outset – as appropriate for the topic selected - the social and behavioral sciences as well as education expertise.

Partnerships

Convergence Accelerator projects are use-inspired research that seeks to transition to practice in ways that benefit society. The Convergence Accelerator program seeks to encourage partnerships with many types of organizations to ensure that research efforts are use-inspired and have a clear path to transition to practice. Therefore, stakeholders from multiple types of organizations must be involved in a way that allows the project to identify and work with end users.

Phase I preliminary proposals should describe the partnerships that are envisioned and a path to grow those relationships.

Phase I proposals, if invited, must include non-academic partners who are directly engaged in the effort demonstrated in the activities described in the proposal and by letters of collaboration. The proposal must also describe how additional partners will be identified and recruited.

Phase II proposals may engage partners in multiple ways:

- As part of the effort described in the proposal. Partners may contribute effort and/or resources that are described in a proposal submitted under this solicitation. The NSF review process will consider the qualifications and resources of the full effort described in the proposal.
- After a proposal is submitted, but before awards are made. Additional partners, collaborators, or other interested parties may provide an "Expression of Interest" (see section VI for additional information on Expressions of Interest), especially following the Pitch Presentations. Expressions of interest will be one element of NSF's decision-making process but are in no way a requirement for an award. An Expression of Interest could lead to an agreement with NSF to contribute resources to a project OR could lead to an agreement directly with the proposing organization or a sub-awardee. Any agreements developed through NSF would be negotiated and implemented separately from awards made under this solicitation. NSF welcomes Unrestricted Gifts as well as more specific agreements.
- After awards are made. Partners, collaborators or contributors may join projects through agreements developed directly with grantee organizations or NSF after an award is made. These may be subject to terms and conditions of the NSF award.

Partnerships supported under this solicitation are not intended as a mechanism to conduct corporate sponsored research but can take advantage of synergistic activities. NSF encourages engagement with for-profit entities (including sharing of data, tools, expertise, or other resources); however, fee or profit may not be requested in NSF proposals submitted under this solicitation.

An Expression of Interest does not guarantee an opportunity for partnership with one or more teams. Potential partnerships suggested by Expressions of Interest will be developed in collaboration with grantee teams. NSF's award-making process will not be tied to negotiation of agreements based on Expressions of Interest, and an Expression of Interest is not a requirement for a Phase II award.

Deliverables

Proposers must identify the actual tools or other resources that the project seeks to develop and describe how those outputs will benefit society. Deliverables may take many forms but must clearly describe how benefits to society would be realized by the end of phase II.

Track

The proposed effort must clearly match the goals described in the track description and must also differ markedly from research that could be supported by other NSF programs, including the Big Ideas and other activities. Track relevance and contributions to track success must be clearly described.

Intellectual Property

Partnerships that facilitate the research effort and transition to practice of research results are a key component of the Convergence Accelerator program. Phase II proposals have a required Intellectual Property Management Plan which is essential for current and future partnerships.

The disposition of rights to inventions made by small business firms, large business firms, and non-profit organizations, including universities, during NSF-assisted research is governed by Chapter 18 of Title 35 of the USC, commonly called the Bayh-Dole Act and EO12591, as amended by EO 12618. Additional information can be found in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG Chapter XI.D). Potential awardees and their partners should familiarize themselves with the information in these documents. Intellectual property (IP) developed with funds from this award is subject to the Bayh-Dole Act and should be differentiated from IP developed separately and contributed by partners. An Intellectual Property Management Plan is a required element of every proposal (see supplementary documents below), and appropriate IP agreements will be required to be in place prior to an award being made. The Intellectual Property Management Plan should clearly describe the management of (1) any pre-existing IP that is relevant to the project and (2) IP that may be developed during the award. The Intellectual Property Management Plan should also indicate the path through which any partners who may join later could access IP.

Broadening Participation in the NSF Convergence Accelerator

NSF is committed to Broadening Participation in all science and engineering fields and research endeavors. The underrepresentation of many groups—including women, African Americans, Hispanics, American Indians, Alaska Natives, Native Hawaiians, Native Pacific Islanders, and persons with disabilities—deprives large segments of the population the opportunity to be creators of research and technology and deprives the scientific enterprise of their potential contributions.

This solicitation requests that each Phase II project prepare a Broadening Participation Plan that describes activities that will be undertaken to increase the participation of underrepresented groups in the project's research and development efforts. The Broadening Participation Plan should be included as a supplementary document not to exceed 2 pages. Examples of ways to engage groups and/or individuals that are typically underrepresented could include: through the expertise of personnel, via partnerships, through work with users and user groups, via engagement with stakeholders, through use of datasets that represent information about underrepresented groups, etc. The Broadening Participation Plans should include: (1) the context of the proposed broadening participation activity(ies), (2) the intended target population(s) for the activity, (3) the plan of activities over the project duration, (4) prior experience (if any) with broadening participation, and/or intended plan for preparation/training of project members in broadening participation, and (5) plans for the measurement and dissemination of outcomes in broadening participation. More information, including potential metrics for activities and examples, can be found at the following

links:

III. AWARD INFORMATION

Anticipated Type of Award: Standard Grant or Cooperative Agreement

Estimated Number of Awards: 1 to 40

30 Phase I Awards

10 Phase II Awards

Anticipated Funding Amount: $30,000,000

Anticipated funding is $30,000,000, pending availability of funds, to support Phase I awards in FY2020. Proposers may request up to $1M for Phase I.

The total amount awarded in future years will depend on the availability of funds and the number of awards advancing to Phase II awards. Phase II proposals may request up to $3,000,000 for year 1 and up to $5,000,000 in total for the two-year Phase II project.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

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

Who May Serve as PI:

The PI and any co-PIs must hold an appointment at an organization that is eligible to submit as described under "Who May Submit Proposals." At least one PI or co-PI from a Phase I award must be included as a PI or co-PI on a Phase II proposal. The same individual who served as PI for the Phase I award does not have to be PI for the Phase II proposal. Any change of PI and co-PI should be fully explained in the proposal.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

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

There are no restrictions or limits.

Additional Eligibility Info:

Phase I Preliminary Proposals

An individual may serve as PI or a co-PI for multiple Phase I preliminary proposals. A PI may receive more than one invitation to submit full Phase I proposals; however, making multiple Phase I awards to the same PI or co-PI is unlikely. An individual may only be a PI or co-PI on one Phase II proposal. This limitation includes PIs and co-PIs listed for the proposing organization or any subaward submitted as part of the proposal. There are no restrictions or limits on serving as Senior Personnel.

Phase I Full Proposals

Phase I full proposals are by invitation only. There is no limit on the number of invited Phase I proposals that can be submitted per organization. However, while there is not a limit on the number of Phase I proposals submitted by an organization, it is unlikely that more than one Phase I proposal per Track will be funded per organization.

Phase II Full Proposals

Phase II full proposals are limited to proposers who receive a Phase I Award under this solicitation and wish to advance to Phase II. The organization that received the Phase I award does not have to be the proposing (lead) organization for the Phase II proposal, however they must have been part of the Phase I team. Any change of proposing organization from Phase I should be explained in the proposal. Only one Phase II proposal may be submitted per Phase I award.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

Preliminary Proposals *(required)*: Preliminary proposals must be submitted via FastLane by 5:00 p.m. submitter's local time on the due date indicated elsewhere in this solicitation. Preliminary proposals must conform to the format restrictions noted in the NSF PAPPG and contain only the permitted sections listed below. Note that no Supplementary Documents are allowed in a Convergence Accelerator Phase I preliminary proposal.

Preliminary proposals must contain the following information:

Cover Sheet: Select the program solicitation number from the drop-down list. The NSF Convergence Accelerator Phase I and II Program solicitation will automatically appear. Check the box indicated for the preliminary proposal. **The title format is** "NSF Convergence Accelerator– Track [provide letter C or D]" followed by the Title. Only the PI and any co-PI's name(s) should appear on the cover page. **No budget should be submitted**; however, please enter $2 in the Requested Amount box on the FastLane Cover Sheet (this entry allows correct FastLane processing).

Project Description. Limited to 2 pages. Indicate how the project idea requires research relevant to two or more intellectually distinct disciplines (convergence). Discuss the intended practical application or useful results and the potential timeframe for these deliverables. Include names and organizational affiliations of the proposed **team**, including designation of a **Principal Investigator**. Describe how the multi-stakeholder convergence team includes, or will include, private sector entities, academic and non-academic organizations, and /or other organizations such as federal government laboratories. Describe how each of the team members will contribute to creating a bold research and development plan and advancing the convergence research. References may be included, however the Project Description must conform to the 2 page limit.

Preliminary proposals must at least *identify* multiple types of potential partners that would be engaged during Phase I in order to be considered for invitation of a full Phase I proposal. The preliminary proposal MUST identify a deliverable that would be refined during Phase I and describe how the deliverable would impact society. Phase I full proposals MUST include engagement with multiple types of organizations, including IHEs, non-profit, and for-profit, as partners or they will be returned without review. Thus, proposers are advised to begin developing partnerships at the Phase I preliminary proposal stage.

Biographical Sketches (2-page limit for each). A Biographical Sketch should be included for each person listed on the Cover page. Biographical sketches should follow the format described in the PAPPG.

No budget should be submitted; however, please enter $2 in the Requested Amount box on the FastLane Cover Sheet (this entry allows correct FastLane processing).

Single Copy Documents. Single Copy Documents are used by NSF staff, but are not available to the reviewers.

- **Collaborators and Other Affiliations for the PI and senior personnel (required)**, see PAPPG;
- Suggested Reviewers and Reviewers Not to Include (optional).

Please note that all other elements of a "full proposal" are waived (Project Summary, References Cited, Current and Pending Support, Budget, Budget Justification, Facilities, Equipment and Other Resources).

Phase I preliminary proposals will be merit reviewed by ad hoc and/or panel review. Phase I preliminary proposals judged to be particularly promising will be invited to submit Phase I full proposals (below). The submitted Phase I preliminary proposals will be reviewed in accordance with the merit review criteria approved by the National Science Board (intellectual merit and broader impacts) and to ensure that the potential proposals have the basic characteristics of NSF Convergence Accelerator projects:

Convergence research:

Does the research concept presented in the preliminary proposal represent research at the highest level of interdisciplinarity?

Partnerships:

Does the preliminary proposal make a strong case that stakeholders from multiple kinds of organizations, including academic and non-academic partners are being brought together?

Track Relevance*:*

Is the research concept presented in the preliminary proposal a close match to one of the track descriptions in this solicitation (C or D)?

Does the proposed research concept differ markedly from research supported by other NSF programs, initiatives, Big Ideas or other NSF funding mechanisms?

Deliverables:

Does the proposed research concept have the potential to deliver results that will benefit society by the end of Phase II?

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via FastLane 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 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.

Phase I Full Proposals

If invited, full proposals are due on **July 10, 2020**. Phase I efforts will focus on research plan development and team formation leading to a proof-of-concept and will include NSF-organized convenings for training and cross-cohort collaboration.

Proposers are strongly encouraged to consult the proposal preparation and submission instructions in the NSF Proposal & Award Policies & Procedures Guide (PAPPG) or NSF Grants.gov Application Guide as they prepare their proposal. Proposals not compliant with the proposal preparation guidelines, as supplemented by the following instructions, may be returned without review.

Full proposals will be reviewed in accordance with the merit review criteria approved by the National Science Board (intellectual merit and broader impacts), keeping in mind the nature of this solicitation.

Proposal Title: The title of the proposal must begin with "NSF Convergence Accelerator Track" followed by the track identifier (C or D) followed by a colon. The rest of the title of the proposal should describe the project in concise, informative language, without use of acronyms, so that a technically literate reader can understand what the project is about. The title should emphasize the science and engineering work to be undertaken and be suitable for use in the public press. The title does not need to be the same as the Phase I preliminary proposal title.

Personnel Listed on the Cover Sheet: Provide complete information requested on the cover sheet for the PI and up to four co-PIs.

Project Summary: Prepare as described in the PAPPG.

Project Description: The project description should provide a clear statement of the work to be undertaken and must include the objectives for the period of the proposed work and expected significance. Proposals should discuss 1) objectives and significance of the proposed activity; 2) the suitability of the methods to be used; 3) the qualifications of the investigators and the participating organizations; 4) the ability of the effort to produce deliverables aligned with one of the tracks in this solicitation; and 5) how activities in the project plan will contribute towards "track success", i.e., the success of the full cohort of projects, in addition to the success of each individual project.

Proposals should clearly describe the specific role and contribution of each team member. Proposals should describe how the proposer will organize collaboration among project members to promote team effectiveness. Specifically address any changes from the Phase I preliminary proposal.

Proposing teams MUST be comprised of researchers and stakeholders from different disciplines that can help catalyze the proposed scientific discovery and accelerate the transition of that innovation into practical use. Phase I teams can involve different partners than were mentioned in the Phase I preliminary proposal. However, at least one of the PI or co-PIs in the Phase I proposal must have served as a PI or co-PI for the Phase I preliminary proposal submission. Any exception to this must be discussed with NSF in advance of proposal submission.

Project descriptions are a maximum of 15 pages and must contain separate sections within the narrative labeled "Intellectual Merit" and "Broader Impacts." Results of prior NSF support must be discussed (see PAPPG for guidelines). This solicitation also has additional solicitation specific review criteria outlined in Section VI below. In addition to the requirements of the PAPPG, the project description must include sections that address the following:

Convergence research: Explain how the work conducted in Phase I represents research at the highest level of interdisciplinarity. Explain how your project uses a convergent research approach, including discussing the intellectually distinct disciplines and areas of expertise needed. Discuss how you will identify additional areas of expertise that may be needed.

Partnership: Describe how stakeholders from multiple kinds of organizations, including academic and non-academic partners, are poised to form deep and diverse partnerships in support of the proposed use-inspired research. Every team is expected to include at least two types of organizations (e.g. industry, government, academia). Describe the roles of different partners and team members in developing deliverables.

Track Relevance: Explain fully the close match to one of the tracks in this solicitation (C or D) and how the proposed work in Phase I will assist in the success of the entire track.

Deliverables: Describe potential future deliverables should the project continue beyond Phase I and describe the timeline for those deliverables. Phase II will end ~June 2023 and your deliverables are expected at that time. You may also discuss preliminary deliverables that will be developed in Phase I. Explain why there is a high probability that this plan will be achieved.

Supplementary Documents:

The proposal should include applicable supplementary documents as instructed in the PAPPG. The following items are to be provided as additional supplementary documents and do not count against the 15-page limit for the project description.

List of Project Personnel: *NSF staff will use this information in the merit review process to manage reviewer selection.* Each proposal must include a table that lists the PI, co-PIs, and all Senior Personnel. This table should list the following information for each individual in separate columns: Last Name; First Name, Middle Initial; Organizational Affiliation. There is no limit on the number of Senior Personnel This personnel table is in addition to the required Collaborators and Other Affiliations information. Note that biographical sketches will also be required for all PIs, co-PIs, and Senior Personnel.

Letters of Collaboration: If the project involves collaborative arrangements of significance, these arrangements should be documented through letters of collaboration. Letters of collaboration should state the intent to collaborate and describe the nature of collaboration, which ideally will include listing the tasks the

collaborator will undertake. The letters should *not* contain endorsements or evaluation of the proposed project or sections of the proposal. Letters should be succinct and in general should not exceed two pages each. Refer to PAPPG Chapter II.C.2.j for instructions, although proposers are asked to provide more information than the PAPPG format for these letters. There is no limit on the number of letters of collaboration. *Please note that letters of recommendation for the PI or other letters of support for the project are not permitted.*

Postdoctoral Researcher Mentoring Plan: *(up to one page)* As described in PAPPG Chapter II.C.2.j, each proposal that requests funding to support postdoctoral researchers must upload under "Mentoring Plan" in the supplementary documentation section, a description of the mentoring activities that will be provided for such individuals.

Phase II Proposals

Proposal Title: The title of the proposal must begin with the track identifier (C or D) followed by a colon. The rest of the title of the proposal should describe the project in concise, informative language, without use of acronyms, so that a technically literate reader can understand what the project is about. The title should emphasize the science and engineering work to be undertaken and be suitable for use in the public press. The title does not need to be the same as the Phase I proposal title.

Personnel Listed on the Cover Sheet: Provide complete information requested on the cover sheet for the PI and up to four co-PIs.

Project Summary: Prepare as described in the PAPPG.

Project Description: The project description should provide a clear statement of the work to be undertaken and must include the objectives for the period of the proposed work and expected significance. Proposals should discuss 1) objectives and significance of the proposed activity; 2) the suitability of the methods to be used; 3) the qualifications of the investigators and the participating organizations; 4) the ability of the effort to produce deliverables aligned with one of the tracks in this solicitation; and 5) how activities in the project plan will contribute towards "track success", i.e., the success of the full cohort of projects, in addition to the success of each individual project.

Proposals should clearly describe the specific role and contribution of each team member. Proposals should describe how the proposer will organize collaboration among project members to promote team effectiveness, taking into account the lessons learned from Phase I activities, such as human-centered design, user interviews, team science techniques, as well as domain-specific activities.

Proposing teams MUST be comprised of researchers and stakeholders from different disciplines that can help catalyze the proposed scientific discovery and accelerate the transition of that innovation into practical use. Phase II teams can involve different partners than were part of the Phase I proposal. However, at least one of the PI or Co-PIs in the Phase II proposal must have served as a PI or Co-PI for that project in Phase I. Any exception to this must be discussed with NSF in advance of proposal submission.

Project descriptions are a maximum of 15 pages and must contain separate sections within the narrative labeled "Intellectual Merit" and "Broader Impacts." Results of prior NSF support must be discussed, including work conducted during Phase I (see PAPPG for guidelines). This solicitation also has additional review criteria outlined in Section VI below. In addition to the requirements of the PAPPG, the project description must include sections that address the following:

Convergence research*:* Explain how the work conducted in Phase I and the work proposed in Phase II represent research at the highest level of interdisciplinarity.

Partnership: Describe how stakeholders from multiple kinds of organizations, including academic and non-academic partners, form deep and diverse partnerships in support of the proposed use-inspired research.

Track*:* Explain the close match to one of the tracks in this solicitation (C or D) and how the proposed work in Phase II will assist in the success of the entire track.

Deliverables: State clearly what are the planned, tangible deliverables, along with milestones, during the two-year award period as well as after two years of funding. Explain why there is a high probability that this plan will be achieved.

Supplementary Documents:

The proposal should include applicable supplementary documents as instructed in the PAPPG. The following items are to be provided as additional supplementary documents and do not count against the 15-page limit for the project description.

- **List of Project Personnel**: *NSF staff will use this information in the merit review process to manage reviewer selection.* Each proposal must include a table that lists the PI, co-PIs, and all Senior Personnel. This table should list the following information for each individual in separate columns: Last Name; First Name, Middle Initial; Organizational Affiliation. There is no limit on the number of Senior Personnel.
- **Phase I Portfolio:** *(up to three pages)* Each proposal should provide discussion of the participation of the project team in the in-person meetings and webinars, discussion of how Phase I efforts modified the project path, and documentation of any creative products or preliminary results developed during Phase I.
- **Timeline of Milestones and Deliverables**: *(one page)* Along with the Convergence Management Plan, each proposal must provide a visual representation (e.g., Gantt chart or alternative) of key milestones during the two-year award period, including creation of specific deliverables.
- **Convergence Management Plan:** *(up to two pages)* Each proposal must contain a Management Plan that describes how the project will be managed across disciplines, institutions, and stakeholder entities over time. This plan should identify specific convergence activities that will enable cross-disciplinary and cross-sectoral integration of teams, such as mentoring and/or professional development/training to support convergent outcomes, and the plan should provide a timeline showing principal tasks and associated interactions. The plan must address the specific roles and responsibilities of the collaborating PI, Co-PIs, other Senior Personnel, paid consultants, partners, any other stakeholder participants, and describe the timing and how tasks will be integrated over the course of the project.
- **Intellectual Property Management Plan:** *(up to three pages) Partnerships that facilitate the research effort and transition to practice of research results are a key element of the Convergence Accelerator program and a clear Intellectual Property Management Plan is essential for current and future partnerships.* Both ownership and management of IP should be addressed in the Intellectual Property Management Plan. The plan should include (1) IP contributed by partners included in this proposal, (2) IP that may be developed during the project, and (3) a plan for access to IP from (1) and (2) by potential future partners. Current and future partners may include, but are not limited to, institutions of higher education, non-profit organizations such as foundations or community organizations, for-profit organizations such as companies or investment groups, local/state/federal government, and others. The Intellectual Property Management Plan must articulate how potential future partners will access intellectual property within the project. Appropriate agreements must be in place before an award is made. Similarly, commitments from partner organizations for sharing of resources (such as data, research instrumentation, or any other required elements for carrying out the proposed work) should be described and formal

agreements must be in place before an award is made. The Intellectual Property Management Plan is protected by the Privacy Act (as is the full proposal) and is the type of non-public information that NSF typically will not release beyond the closed, confidential review process, even under FOIA or other request. The Intellectual Property Management Plan will NOT be shared with organizations attending the pitch competition, but appropriate information that can be shared should be included in the Public Executive Summary document.

- **Broadening Participation Plan:** *(up to two pages)* This solicitation requests that each project prepare a Broadening Participation Plan that describes activities that will be undertaken to increase the participation of underrepresented groups in the project's research and development efforts. The Broadening Participation Plan should be included as a supplementary document not to exceed 2 pages. Examples of ways to engage groups and/or individuals that are typically underrepresented could include: through the expertise of personnel, via partnerships, through work with users and user groups, via engagement with stakeholders, through use of datasets that represent information about underrepresented groups, etc. The Broadening Participation Plans should include: (1) the context of the proposed broadening participation activity(s), (2) the intended target population(s) for the activity(s), (3) the plan of activities over the project duration, (4) prior experience (if any) with broadening participation, and/or intended plan for preparation/training of project members in broadening participation, and (5) plans for the measurement and dissemination of outcomes in broadening participation.
- **Data Management Plan:** *(up to two pages)* In addition to the general elements of the data management plan described in the PAPPG, proposals should address within the Data Management Plan their plans for data-sharing across their team, across the track with other teams, and with the general public, during the project and after its completion as well.
- **Contribution to Track Success:** *(up to two pages)* Each proposal should include a description of how the proposed project will contribute to an integrated overall effort that will deliver useful outputs. This document should describe the types of activities that are proposed to be undertaken to promote track integration. After the awards are made, Phase II projects in each track will have the opportunity to interact and refine their plan for these integrating activities, with approval from NSF.
- **Public Executive Summary:** *(up to two pages)* Because the NSF is interested in partnering with industry, foundations, investment community, and others in Phase II, the proposal MUST include a Public Executive Summary that will be posted publicly and shared with potential NSF partners prior to the pitch competition. This supplementary document is the only element of the Phase II proposal that will be shared with attendees at the pitch competition and may also be posted publicly on the NSF Convergence Accelerator website. At a minimum, the Public Executive Summary should include the following: (1) Summary of the project's objectives and deliverables; (2) Current status of the intellectual property associated with the project; (3) Summary of the Intellectual Property Management Plan (produced as one of the supplementary documents mentioned previously); (4) A description of the current industry partners and how they are participating in the current Phase I activities and their expected participation in Phase II; (5) A clear and concise description of how the proposed project is different from other research and a comparison of other similar work the team is aware of; and (6) A description of the timeline for proposed milestones and deliverables of the project. The Executive Summary may include other information to help potential NSF partners decide about possible co-funding or provision of resources to the project. Potential partners will not receive any additional documentation from NSF other than the Public Executive Summary, but additional information may be requested from the proposer.
- **Letters of Collaboration:** If the project involves collaborative arrangements of significance, these arrangements should be documented through letters of collaboration. Letters of collaboration should state the intent to collaborate and describe the nature of collaboration, which ideally will include listing the tasks the collaborator will undertake. The letters should *not* contain endorsements or evaluation of the proposed project or sections of the proposal. Letters should be succinct and in general should not exceed two pages each. Refer to PAPPG Chapter II.C.2.j for instructions, although proposers are asked to provide more information than the PAPPG format for these letters. There is no limit on the number of letters of collaboration. *Please note that letters of recommendation for the PI or other letters of support for the project are not permitted.*
- **Postdoctoral Researcher Mentoring Plan:** *(up to one page)* As described in PAPPG Chapter II.C.2.j each proposal that requests funding to support postdoctoral researchers must upload under "Mentoring Plan" in the supplementary documentation section, a description of the mentoring activities that will be provided for such individuals.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Other Budgetary Limitations:

Budget Preparation Instructions:

Phase II proposals should include a two-year budget. The budget for year 1 should not exceed $3,000,000 for the first year and the total budget for the two-year project should not exceed $5,000,000. Teams that show significant progress during the first year, in accordance with the agreed timetable of milestones and deliverables, may receive funding for a second year. Teams should plan on completing the effort within two years; no cost extensions will be authorized only in extraordinary circumstances.

Budgets for all projects must include funding for Senior Personnel to attend at least three meetings per year in the Washington, DC area.

Because a **significant level of personnel effort is expected** in order to achieve deliverables that benefit the American people in two years, PIs, Co-PIs and other Senior Personnel **may request more than two months of salary support**. The NSF Proposal & Award Policies & Procedures Guide (PAPPG) Chapter II.C.2.g.(i)(a) contains NSF's policy on Senior Personnel salaries and wages. Any compensation for Senior Personnel in excess of two months must be disclosed in the proposal budget, justified in the budget justification, and must be specifically approved by NSF in the award notice budget.

Approximately 10% of the overall budget amount, and no less than 5%, should be set aside for collaboration among Phase II projects for track integration and potential cross-track activities. The **Proposal** should describe the types of activities that are proposed to be undertaken to promote track integration, and/or other cross-track activities. After the awards are made, Phase II projects in each track will have the opportunity to interact and refine their plans for these activities, with approval from NSF.

Although many proposals to this solicitation will include the participation of for-profit entities, note that NSF award budgets may not include profit or fee as line items.

Contributions from Partners should be described in the Facilities, Equipment and Other Resources section of the proposal which is described in *NSF Proposal & Award Policies & Procedures Guide (PAPPG) Chapter II.C.2.i.* It is not appropriate in this section to list funding amounts that may be contributed by partners. Instead, proposers should describe what facilities, equipment and other resources will be possible based on contributions (financial and otherwise) from any partners. Voluntary committed cost sharing is prohibited *NSF Proposal & Award Policies & Procedures Guide (PAPPG) Chapter II.C.2.g.xii.*

C. Due Dates

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

    May 11, 2020

        Phase I Preliminary Proposal

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

    July 10, 2020

        Phase I Full Proposals, by invitation only

    May 17, 2021

        Phase II Full Proposals, only Phase I awardees are eligible

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

Phase I Preliminary Proposal

In addition to above criteria, reviewers will be asked to address the following questions:

- Convergence Research
    - Does the Phase I preliminary proposal represent research at the highest level of interdisciplinarity?
- Partnership
    - Does the Phase I preliminary proposal make a strong case that stakeholders from multiple kinds of organizations, including academic and non-academic partners are being brought together?
- Track
    - Is the research concept a close match to one of the tracks in this solicitation (C or D)?
    - Does the proposed research concept differ markedly from research supported by other NSF programs, initiatives, Big Ideas or other NSF funding mechanisms?
- Deliverables
    - Does the proposed research concept have the potential to deliver results that will benefit society in the next several years?

Phase I Full Proposal

In addition to above criteria, reviewers will be asked to address the following questions:

- Convergence Research
    - Does the Project Description represent research at the highest level of interdisciplinarity, justifying this investment in supporting a convergence research team?
- Partnership
    - Does the proposal - including letters of collaboration and the Facilities, Equipment and Other Resources section - make a strong case that stakeholders from multiple kinds of organizations, including academic and non-academic partners are poised to form a deep and diverse partnership that supports the use-inspired research proposed?
- Track
    - Is the proposed research appropriate, i.e., is there a close match to one of the tracks in this solicitation (C or D)?
    - Do the proposed ideas differ markedly from research supported by other NSF programs, initiatives, Big Ideas or other NSF funding mechanisms?
    - How will the proposed work in Phase I assist in the success of the entire track?
- Deliverables
    - Do the Project Description and Letters of Collaboration indicate a high probability of forming a convergence research team that will be able to achieve results in Phase I and develop a strong Phase II proposal? Namely one that can deliver results within a two-year period that will ultimately benefit society?

Phase II Proposal

In addition to above criteria, reviewers will be asked to address the following questions:

- Convergence Research
    - Do the Project Description, Phase I Portfolio, and Convergence Management Plan represent research at the highest level of interdisciplinarity, justifying this investment in supporting a convergence research team?
- Partnership
    - Does the proposal - including letters of collaboration and the Facilities, Equipment and Other Resources section - make a strong case that stakeholders from multiple kinds of organizations, including academic and non-academic partners, form a deep and diverse partnership that supports the use-inspired research proposed?
- Track
    - Is the proposed research appropriate, i.e., is there a close match to one of the tracks in this solicitation (C or D)?
    - Do the proposed ideas differ markedly from research supported by other NSF programs, initiatives, Big Ideas or other NSF funding mechanisms?
    - Is there a convincing explanation of how the effort proposed in Phase II will assist in the success of the entire track?
- Deliverables
    - Do the Project Description, Convergence Management Plan, and Timeline of Milestones and Deliverables indicate a high probability of deliverables within a two-year period that will ultimately benefit society?

Phase II proposals only will go through an additional Merit Review Process as described below:

Pitch Competition

Following the proposal review panels, the Convergence Accelerator Office will execute an in-person oral *pitch competition* consisting of two "pitch days." Pitch Day 1 will consist of two sessions – one for Track C and one for Track D. The Track C and D events will run in parallel. Each Day 1 pitch session will have a separate review panel with members from academia, industry, and other sectors. The Pitch Day 1 event will include NSF reviewers and competing teams only.

The review criteria for the pitch session are the same as those applied to the written proposal and described above. Intellectual Merit and Broader Impacts continue to be the key review criteria. From the solicitation specific review criteria, Partnerships and Deliverables may be easier to assess in the pitch format than Track and Convergence, but reviewers will be asked to comment on all four areas.

Expressions of Interest

The Pitch Day 2 event will be presented to an invited audience of other potential funders from industry, foundations, other government agencies, and other members of the investment community, as well as the broader public (press, etc.). These Pitch Day 2 attendees will have the opportunity to provide "Expressions of Interest" in projects. Any organization or individual that seeks to attend the pitch competition should contact the Cognizant Program Officers listed at the beginning of this solicitation and C-Accel@nsf.gov. Invitations to attend the pitch competition will focus on organizations interested in potentially contributing resources to the specific research and development areas identified in the Phase II projects, but other interested groups and individuals may also attend. Accordingly, only information that is intended for a public audience should be included in the Pitch Day 2 Presentation. Expressions of Interest may be submitted at any time by email to C-Accel@nsf.gov, but are primarily expected within approximately one week of the pitch competition. A format for potential Expressions of Interest will be provided at the pitch competition and will be available online. Additional information will be provided when the Public Executive

Summaries are posted on the NSF Convergence Accelerator website.

Schedule and Location for Pitch Presentations

The National Science Foundation will notify all proposers of the schedule for the oral Pitch Presentations and provide further details as they become available. Pitch Presentations will likely be held in or near Washington, DC, at a location near the National Science Foundation. Pitch Presentations should comply with these instructions and any additional instructions that the NSF may provide prior to the presentation. The date of the pitch competition will be approximately 2-4 weeks after the full proposal due date.

Participation and Attendance in the Pitch

A proposer's oral Pitch Presentation team may include the presenter and up to four others. The proposer may send a maximum of 5 representatives to the Pitch Presentation. Representatives may be from any of the Convergence Accelerator team members. The presenter should be a person engaged with the project, such as the PI, a Co-PI, or a Senior Personnel member from the team. Any one (or more) of these individuals can make the presentation. It is not required that the PI be the presenter, but the presenter should not be a person engaged just to make the pitch.

Format of the Pitch

The Pitch Presentations will occur as follows:

- The proposer will have about 8 minutes (maximum 10 minutes) to present their proposed Convergence Accelerator Phase II approach to the review panel on Pitch Day 1.
- Time may be allocated for the NSF pitch review panels to ask questions of the proposer following their pitch on Day 1. The question-and-answer period does not count against the oral Pitch Presentation time limit.
- Proposers will have approximately 5-8 minutes to present their proposed Convergence Accelerator Phase II approach on Pitch Day 2. The exact time allotted will be defined for proposing teams at least one month prior to the pitch events. Because the NSF is interested in partnering with industry, foundations, investment community, and others in Phase II, the NSF intends to open the Day 2 Pitch Presentations to participation from these communities and potentially also the broader public by invitation. Organizations wishing to attend the Pitch Presentation should contact the Cognizant Program Officers at the beginning of this solicitation and C-Accel@nsf.gov.
- The NSF reserves the right to hold question-and-answer session(s) during or immediately after Pitch Day 2. The question-and-answer session(s) does not count against the oral Pitch Presentation time limit.

Expected Pitch Content

The oral Pitch Presentation should address the following:

1. Introduce the team number and name, names and titles of presenting personnel and their role in this project, and provide a brief (one sentence) description of the Phase II project.
2. Provide a brief summary of the Convergence Accelerator Phase I project that includes:
   - The initial objectives of the project when it was funded.
   - Key learnings during the Phase I project and how they resulted in revision to project plans and deliverables and informed the Phase II application.
   - Any outcomes or outputs from the Phase I project.
3. Provide a summary of the proposed Convergence Accelerator Phase II project that includes:
   - A clear description of the innovation and why it is needed.
   - The broader social impact of the project, including potential applications if the Phase II effort is successful.
   - The objectives for the project.
   - The key deliverables and expected outcomes (concrete and measurable).
   - The capacity and capabilities of the team to execute the project including management, staffing and necessary technical and other skills.
   - The current and expected partners making firm commitments that will help the team achieve the project goals. This may include collaborations with other teams.
   - Describe project elements and activities that will contribute to integrating efforts among or across projects to achieve track success.
4. Any additional topics provided by the NSF prior to the oral Pitch Presentation.

The above topics should successfully address the Merit Review Criteria of Intellectual Merit and Broader Impacts, as well as the solicitation specific criteria, set forth previously in this solicitation.

Teams may prepare different presentations for the Pitch Day 1 and Pitch Day 2 events.

Presentation Media

Proposers shall prepare all presentations using electronic presentation tools when making the oral pitch presentation. The proposer shall provide electronic copies of the oral pitch presentation one week in advance of the presentation.

Overall Evaluation for Phase II awards

NSF will assemble a list of recommended Phase II awards based on all review information available, including the written proposal reviews and the Day 1 pitch reviews. This is the core material the program will use in making award recommendations. Expressions of Interest will be considered separately from the proposal and pitch panel reviews based on complementarity with NSF's mission and the specific goals of the Convergence Accelerator. Proposing teams can choose if and how to engage with any organization that seeks to interact with them directly or via an Expression of Interest. An Expression of Interest is not required for a Phase II award recommendation, and the presence of Expressions of Interest does not guarantee Phase II success. NSF will consider the extent to which Expressions of Interest complement NSF goals, seem likely to assist project success, are desired by the project team, and seem likely to increase the success of the overall track. These considerations may influence final award recommendations.

If Expressions of Interest lead to agreements to support projects between organizations and NSF, proposers potentially receiving support via those agreements will have a role in defining the list of materials that would be shared with any organizations providing support. Shared materials could include unattributed reviews (from proposal, pitch, or post-award side visits), progress reports, elements of the proposal itself, or other materials.

B. Review and Selection Process

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

NSF Convergence Accelerator Phase II awards are made in the form of cooperative agreements. The cooperative agreements will have a section of Special Conditions relating to the period of performance, statement of work, awardee responsibilities, NSF responsibilities, joint NSF-awardee responsibilities, funding and funding schedule, reporting requirements, Senior Personnel, and other conditions. Senior Personnel will be required to participate in a site-visit or reverse-site-visit evaluation meeting (at NSF) near the end of year one. The purpose of the evaluation meeting is to assess progress the awardees have made towards advancing project goals via a well-functioning interdisciplinary and multi-organization team. Each awardee team will prepare briefing material (expected to be 10 pages or less) describing its accomplishments and make a short presentation which will be followed by questions and answers. The reviewers will evaluate the team's progress towards its stated goals and, in particular, progress towards creating deliverables. Taking into account reviewers' input, NSF will decide if the team will receive funding for the second year.

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

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

After programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications. After an administrative review has occurred, Grants and Agreements Officers perform the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

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

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

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

Special Award Conditions:

Phase I

None.

Phase II

NSF Convergence Accelerator Phase II awards will be made in the form of cooperative agreements. The cooperative agreements will have a section of Special Conditions relating to the period of performance, statement of work, awardee responsibilities, NSF responsibilities, joint NSF-awardee responsibilities, funding and funding schedule, reporting requirements, Senior Personnel, and other conditions. Within the first approximately 30 days of the Award, all Senior Personnel will be required to participate in an approximately two-day meeting at NSF. In addition, Senior Personnel will be required to attend an evaluation meeting at NSF

near the end of year one. The purpose of the evaluation meeting is to assess progress the awardees have made towards advancing project goals via a well-functioning interdisciplinary and multi-organization team. Each awardee team will prepare briefing material (expected to be 10 pages or less) describing its accomplishments and make a short presentation which will be followed by questions and answers. The reviewers will evaluate the team's progress towards its stated goals and, in particular, progress towards creating deliverables. Taking into account reviewers' input, NSF will make a decision if the team will receive funding for the second year. As noted in "Budget Preparation Instructions," budgets for all projects must include funding for Senior Personnel to attend three meetings per year at NSF. At least one of these meetings each year is likely to focus on track integration.

The NSF Convergence Accelerator Phase II projects will be required to submit annual project reports and plans which will be used as a basis for performance review and determining the obligation of funding continuing grant increments. Annual reviews of progress will also take the form of site visit(s) or reverse site visit(s). In addition, PIs will be required to participate in other meetings and interactions with NSF staff and provide documentation for these meetings. The data will capture the information required to demonstrate progress towards achieving the project goals and the goals of the relevant track (C or D) of the 2020 NSF Convergence Accelerator.

Awardees will be required to include appropriate acknowledgment of NSF support under the NSF Convergence Accelerator 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 Convergence Accelerator under Award No. (Grantee enters NSF award number.)"

Awardees 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.

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:

- Linda Molnar, telephone: (703) 292-8316, email: lmolnar@nsf.gov

- Lara A. Campbell, telephone: (703) 292-7049, email: lcampbel@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 (FASED) provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See the *NSF Proposal & Award Policies & Procedures Guide* Chapter II.E.6 for instructions regarding preparation of these types of proposals.

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

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

> The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.
>
> To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at https://www.nsf.gov
>
> - **Location:** 2415 Eisenhower Avenue, Alexandria, VA 22314
>
> - **For General Information** (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) 292-8134
>
> - **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.

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