July 9, 2020

AMENDED NOTICE OF FUNDING OPPORTUNITY (NOFO)
for
Assessment of the Retrospective and Prospective Economic Impacts of Investments in U.S. Neutron Research Sources and Facilities from 1968 to 2030

NIST is issuing this amendment to revise the Evaluation Criteria in Section V.1.a. to match the program goals in Section I.7), insert the missing Evaluation Criteria in Section V.1.d.(1), and extend the application deadline as a result of the revisions.

#	NEW PAGE	SECTION	WHAT DOES THE AMENDMENT DO?	THE NEW TEXT NOW READS:
1	3	Executive Summary	Changes the Announcement Type.	**Announcement Type**: Amendment 2
2	3 and 28	Executive Summary and IV.4.	Extends the application deadline.	Applications must be received at Grants.gov no later than 11:59 p.m. Eastern Time, Wednesday, August 5, 2020.
3	31-32	V.1.a.5); V.1.a.6); V.1.a.7)	Revises the Evaluation Criteria.	5) Assess the expected U.S. and international government policy response—specific to phases in the R&D cycle, technology transfer efforts, and subsequent scale-up (capital formation)—of future investment in neutron facilities; 6) Identify potential areas for future neutron-scattering research investments that would enhance that would enhance U.S. competitiveness and national and economic security; 7) Conduct four case studies, two of past and two of ongoing, collaborative efforts in neutron research

#	NEW PAGE	SECTION	WHAT DOES THE AMENDMENT DO?	THE NEW TEXT NOW READS:
				between a federal and/or university or educational institution laboratory, and academia, private industry, and /or other federal laboratories, including at least one case study of collaboration with the NBSR/NCNR.
4	32-33	V.1.d.(1)	Insert text that was inadvertently omitted from Evaluation Criteria.	• any past experience with evaluating the economic impact of the technology infrastructure; • any past experience in conducting prospective economic impact studies; • any past experience in the following disciplines: technology assessment, high-tech industry behavioral and structural analyses, microeconomic modeling of complex technology development and commercialization patterns, high-tech industry survey and data collection techniques, and quantitative and qualitative analyses of technology infrastructure gaps that are inhibiting the advancement of technologies (if an applicant as an organization cannot demonstrate expertise in these disciplines, the reviewers will evaluate the applicant's plan showing how the applicant will obtain such expertise to meet the objectives of this NOFO); and • any previously demonstrated ability to achieve positive outcomes in endeavors with program objectives that are similar to those of this NOFO as described in Section I. of this NOFO.

The full text of the Amended NOFO, including revisions described in the Amendment 1, dated May 22, 2020, is set forth below.

NOTICE OF FUNDING OPPORTUNITY (NOFO)
Assessment of the Retrospective and Prospective Economic Impacts of Investments in U.S. Neutron Research Sources and Facilities from 1968 to 2030
AMENDMENT 2

EXECUTIVE SUMMARY

- **Federal Agency Name:** National Institute of Standards and Technology (NIST), United States Department of Commerce (DoC)

- **Funding Opportunity Title:** Assessment of the Retrospective and Prospective Economic Impacts of Investments in U.S. Neutron Research Sources and Facilities from 1968 to 2030

- **Announcement Type:** Amendment 2

- **Funding Opportunity Number**: 2020-NIST-TPO-01

- **Assistance Listing (CFDA Number):** 11.620; Science, Technology, Business, and/or Education Outreach.

- **Dates:** Applications must be received at Grants.gov no later than 11:59 p.m. Eastern Time, Wednesday, August 5, 2020. Applications received after this deadline will not be reviewed or considered. Paper applications will not be accepted.

  Applicants should be aware, and factor in their application submission planning, that the Grants.gov system is expected to be closed for routine maintenance at the following times. Applications cannot be submitted when Grants.gov is closed:

From 12:01 A.M. Eastern Time Saturday	To 6:00 A.M. Eastern Time Monday
June 20, 2020	June 22, 2020
July 18, 2020	July 20, 2020

  NIST expects to complete its review, selection of successful applicants, and award processing by November 2020. NIST expects the earliest start date for awards under this NOFO to be November 2020.

  Applicants are strongly urged to read Section IV.2.b. Attachment of Required Application Documents of this NOFO with great attention. Applicants should carefully follow the instructions and recommendations regarding attachments and

use the Download Submitted Forms and Applications feature on www.Grants.gov to check that all required attachments were contained in their submission. Applications submitted without the required documents will not pass the Initial Administrative Review, described in Section V.3.a. of this NOFO.

When developing the submission timeline, please keep in mind that: (1) all applicants are required to have current registrations in the electronic System for Award Management (SAM.gov) and Grants.gov; (2) the free annual registration process in SAM.gov (*see* Section IV.3. and Section IV.7.a.(1).(b) of this NOFO) generally takes between three and five business days but can take more than two weeks; and (3) applicants will receive e-mail notifications over a period of up to two business days as the application moves through intermediate systems before the applicant learns via a validation or rejection notification whether NIST has received the application. (See Grants.gov for full information on application and notification through Grants.gov). Please note that a federal assistance award cannot be issued if the designated recipient's registration in SAM.gov is not current at the time of the award.

- **Application Submission Address:** Applications must be submitted using Grants.gov.

- **Funding Opportunity Description:** The NIST's Technology Partnerships Office (TPO) is seeking proposals from eligible applicants to assess the Nation's current and future need for neutron research sources and facilities. Advanced neutron research facilities, sources, and instruments are essential to science and engineering, to the study and design of new materials, and to the development of technologies and products vital to the U.S. economy, national security, and daily life. The recipient will analyze both realized and potential economic impacts resulting from current and potential future investments in neutron research sources and facilities. The recipient will also assess how well the suite of U.S. neutron sources meets current and anticipated future U.S. scientific and technical needs, in order to ensure U.S. scientific competitiveness and economic vitality.

- **Anticipated Amounts:** In Fiscal Year 2021 (FY21), NIST anticipates funding one award for approximately $800,000 with a project performance period of two (2) years.

- **Funding Instrument:** Cooperative Agreement

- **Eligibility:** Eligibility for the program listed in this NOFO is open to all non-Federal entities. Eligible applicants include accredited institutions of higher education; non-profit organizations; for-profit organizations incorporated in the

United States; state, local, territorial, and Indian tribal governments; foreign public entities; and foreign organizations. Please note that individuals and unincorporated sole proprietors are not considered "non-Federal entities" and are not eligible to apply under this NOFO. Although Federal entities are not eligible to receive funding under this NOFO, they may participate as unfunded collaborators.

- **Cost Sharing Requirements:** Non-federal cost share is not required for awards issued pursuant to this NOFO.

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FULL ANNOUNCEMENT TEXT

I. Program Description

The statutory authority for Assessment of the Retrospective and Prospective Economic Impacts of Investments in U.S. Neutron Research Sources and Facilities from 1968 to 2030 (Program) is 15 U.S.C. §§ 272(b)(4) and (c)(22).

1) Background Information

In FY18, the Federal Government invested nearly $150 billion in federally-funded research and development (R&D). Approximately $100 billion of this investment is in extramural research and development at universities, non-profits, and small and large businesses across the country. Over $50 billion of this research was conducted at over 300 government-owned, government-operated (GOGO) and government- owned, contractor-operated (GOCO) laboratories across the country.[1] Some of this work will yield extraordinary long-term economic impacts through the generation of new knowledge and job-creating technological

[1] https://ncsesdata.nsf.gov/fedfunds/2017/ - tables 8 and 10

breakthroughs that support U.S. competitiveness in the global economy. To ensure that the benefits of this research are fully realized by the taxpayer, its results must be transferred to the private sector. Traditional forms of technology transfer include licensing intellectual property and entering into cooperative research and development agreements; however, other forms of technology transfer also convey research results and know-how to the private sector and produce economic benefits. These can include publications, postdoctoral research programs, access to unique user facilities, and participation in standards development organizations. Maximizing the utilization of results of federally funded research, including research related to the development of standards, is in the best interest of the taxpayers.

Recognizing the importance of focused agency efforts to improve federal technology transfer, the Lab-to-Market initiative was established in 2014.[2] These agency strategic efforts are ongoing through designation as a Cross Agency Priority (CAP) goal in the FY18 President's Management Agenda.[3] NIST, in conjunction with the White House's Office of Science and Technology Policy, leads CAP goal efforts, with participation from 11 R&D agencies in total, in five areas: Identify regulatory and administrative improvements, Increase engagement with the private sector, Build a more entrepreneurial R&D workforce, Support innovative tools and services for technology transfer, and Improve understanding of global science and technology trends and benchmarks.[4]

2) Overview

The combined $150 billion of extramural and intramural research of the Federal government's total R&D investment underpins the nation's scientific research base. This investment in fundamental research expands the frontiers of human understanding and yields extraordinary long-term economic impact through the creation of new knowledge, new technologies, and ultimately new industries. NIST has a leadership role within a large group of public and private stakeholders and aids this group in establishing goals, measuring performance, establishing standards, streamlining administrative processes, and facilitating partnerships that

[2] https://www.nist.gov/tpo/lab-market
[3] https://www.performance.gov/PMA/PMA.html.
[4] CAP Goal 14: This goal will improve the transition of federally funded innovations from the laboratory to the marketplace by reducing the administrative and regulatory burdens for technology transfer and increasing private sector investment in later-stage research and development (R&D); develop and implement more effective partnering models and technology transfer mechanisms for Federal agencies; and enhance the effectiveness of technology transfer by improving the methods for evaluating the ROI and economic and national security impacts of federally funded R&D, and using that information to focus efforts on approaches proven to work. https://www.performance.gov/CAP/lab-to-market/

encourage commercialization of these federally funded research and development efforts.

To support this role, NIST engages in ongoing efforts to track technology transfer activity metrics and directs economic research studies that estimate the importance of federal technologies and supporting technical infrastructure. NIST supports the overall development of economic impact metrics for the federal and university communities, in order to capture the benefits of technology transfer activities to the general public, and to broaden the economic research in this area of economic study. NIST uses its leadership role to help facilitate the economic assessment of all federal laboratories and their technology transfer efforts, as well as to collaborate with universities and other entities to develop the measurement of technology transfer and its impact on the U.S. economy.

Both federal and university technology transfer systems and outcomes need to be further studied by the academic community, including the impact of intramural research performed by federal laboratories and the corresponding research conducted at university research facilities. NIST is therefore offering this funding opportunity, which is directed at assessing the Nation's current and future need for neutron research facilities. Specifically, the goals of this funding opportunity are to analyze 1) both realized and potential future economic impacts resulting from investments in neutron research sources and facilities since 1968 through 2030 in the United States, including the National Bureau of Standards Reactor (NBSR) and its successor, the NIST Center for Neutron Research (NCNR) (collectively referred to as the NBSR/NCNR); and 2) how well the suite of U.S. neutron sources meets current and anticipated future U.S. science and technical needs in order to ensure U.S. scientific competitiveness and economic vitality.

The NIST Technology Partnerships Office is seeking proposals for the conduct of economic research to support the goals of the Lab-to-Market initiative to understand global trends and benchmarks through the publication of research on federal and university technology transfer efforts, as described in this NOFO. Therefore, research proposals must support the overall goals of the Lab-to-Market program.

3) Neutron Research at Federal Laboratories

Neutrons provide a uniquely effective probe of the structure and dynamics of materials ranging from water moving near the surface of proteins to magnetic domains in memory storage materials. The properties of neutrons (outlined below) can be exploited using a variety of measurement techniques to provide information not otherwise available. The positions of atomic nuclei in crystals, especially of

those of light atoms, can be determined precisely. Atomic motion can be directly measured and monitored as a function of temperature or pressure. Neutrons are especially sensitive to hydrogen, so much so that hydrogen motion can be followed in H-storage materials and water flow in fuel cells can be imaged in real time. Neutrons are also highly penetrating; thus residual stresses located deep within oil pipelines or highway trusses can be mapped. Neutron-based measurements contribute to a broad spectrum of research activities related to engineering, materials development, polymer dynamics, chemical technology, biology, medicine, physics, and much more.

The United States has important neutron measurement capacity that is integral to the U.S. scientific community and economy, and includes both federal and university facilities. The federal facilities include the Spallation Neutron Source (SNS) and High-Flux Isotope Reactor (HFIR), both located at Oak Ridge National Laboratory (ORNL); the Los Alamos Neutron Science Center (LANSCE), located at Los Alamos National Laboratory (LANL); and the NIST Center for Neutron Research (NCNR), located at the National Institute of Standards and Technology (NIST).

ORNL, the largest U.S. Department of Energy (DOE) science and energy laboratory, conducts basic and applied research to deliver transformative solutions to compelling problems in energy and security. Located in eastern Tennessee, near Knoxville, ORNL's HFIR and SNS represent two of the most advanced neutron research facilities in the world. Both are U.S. DOE-sponsored scientific user facilities, open to researchers to advance the frontiers of science and technology. Beam time at either facility is granted through the User Program and is free of charge on the condition that researchers publish their results, making them available to the scientific community.

The HFIR is considered the most powerful reactor-based source of neutrons in the United States. Constructed in the 1960s to produce heavy elements like plutonium and curium, today its four primary tasks are neutron scattering, isotope production, irradiation materials testing, and neutron activation analysis. The facility's high neutron flux provides a unique source that is used for medical, industrial, and research isotope production, as well as for studies of severe neutron damage to materials and for neutron activation to detect trace elements. On average, 3,900 hours of beam time are provided each year via 12 neutron-scattering instruments. Hundreds of scientists and engineers from universities, industry, and government laboratories conduct some 300 experiments, and over 1300 materials and neutron activation analysis irradiations annually.

The SNS produces neutrons that are directed toward state-of-the-art instruments

that provide a variety of capabilities to researchers across a broad range of disciplines, including physics, biology, chemistry, and materials science. In addition, the SNS facility allows for measurements of greater sensitivity, greater speed, higher resolution, and the availability of more complex sample environments, than those at other neutron facilities worldwide. The SNS offers 18 instruments covering a wide range of science and capabilities.

The U.S. DOE-sponsored Los Alamos Neutron Science Center (LANSCE) is the major experimental science facility at LANL, underpinning the laboratory as a world-class scientific institution. Los Alamos, situated in the high desert of northern New Mexico, is just 35 miles from Santa Fe. LANSCE is a national user facility with one of the nation's most powerful linear accelerators (LINAC). It is unique because of the intensity and energy spectrum of the neutrons the LINAC produces. The intense pulsed protons are used for proton radiography and to produce the wide energy spectrum of spallation neutrons needed to characterize various materials—materials that improve safety and security, advance nuclear technology, and have commercial applications. To meet DOE and National Nuclear Security Administration (NNSA, part of DOE) missions, the LINAC supports five state-of-the-art scientific centers that operate simultaneously: the Lujan Center, Weapons Neutron Research, Proton Radiography, Isotope Production Facility, and Ultracold Neutrons. LANSCE research is critical to understanding nuclear weapons performance, reliability, and safety and assists in validating predictive models of weapons performance.

For more than 30 years LANSCE has provided the scientific underpinnings in nuclear physics and material science needed to ensure the safety and surety of the U.S. nuclear stockpile into the future. In addition to national security research, the LANSCE User Facility has a vibrant research program in fundamental science, providing the scientific community with intense sources of neutrons and protons to perform experiments supporting civilian research and the production of medical and research isotopes.

The NIST Center for Neutron Research (NCNR), located in Gaithersburg, Maryland, is a national user facility for neutron-based research using cold and thermal neutrons that ranks as one of the world's best. NCNR activities focus on providing merit-based access to state-of-the-art neutron instrumentation to the U.S. and global research communities. The NCNR mission is to operate safely as a cost-effective national resource, to conduct a broad program of research using neutron techniques, and to develop and apply new, cutting-edge neutron measurement techniques that best meet the needs of its users. In 2018 the NCNR served over

2,500[5] research participants from numerous federal national laboratories and agencies, universities, and private industry. Many NCNR instruments rely on intense beams of cold neutrons that emanate from an advanced liquid-hydrogen moderator.

Instrument beam time for research intended for publication in the open literature is made available without cost to the user, but full operating costs are recovered for proprietary research. Access is gained mainly through a web-based, peer-reviewed proposal system with user time allotted by a beamtime allocation committee twice a year.[6] The National Science Foundation and NIST co-fund the Center for High Resolution Neutron Scattering (CHRNS), which currently operates five of the world's most advanced instruments. Time on the CHRNS instruments is made available through the proposal system. Some access to beam time for collaborative measurements with NIST scientific staff can also be arranged on other instruments.

The NCNR's neutron source provides the intense, conditioned beams required for many types of measurements. In addition to the thermal neutron beams from the heavy water moderator, the NCNR has two liquid hydrogen moderators, or cold sources, which supply neutrons to three-fourths of the instruments. One is a large area moderator and the other is smaller, but with high brightness. These moderators provide cold (long-wavelength) neutron beams that find greatest use in fields such as polymer science and biology but are also of extreme utility to researchers in magnetism and other areas of materials science.

The NCNR currently operates 29 experiment stations: 12 are used for neutron physics, analytical chemistry, or imaging, and 17 are beam facilities for neutron-scattering research.[7] The second guide hall is currently populated with seven instruments. Two new cold neutron-scattering instruments are under development, including a very small angle neutron-scattering instrument (vSANS), and a quasi-white beam neutron reflectometer (CANDOR).

4) Neutron research sources and facilities at universities and educational institutions

Three premier neutron research facilities and sources located at universities and educational institutions include the Massachusetts Institute of Technology Nuclear

[5] In 2018, research participants were from 22 NIST divisions and offices; 37 U.S. government laboratories; 42 U.S. states and D.C; 51 U.S. corporations; and 185 U.S. universities. 2018 *NIST Center for Neutron Research Accomplishments and Opportunities*, NIST Special Publication 1231, February 2019, p. 60.
[6] www.ncnr.nist.gov/beamtime.html.
[7] Complete descriptions can be found at www.ncnr.nist.gov/instruments/.

Reactor Laboratory (MIT-NLR), the University of Missouri (Columbia) Research Reactor (MURR), and the Penn State Neutron Beam Laboratory (PS-NBL). All three neutron facilities were built in the late 1950s—the MIT-NLR in 1958, MURR in 1959, and PS-NBL in 1958.

MIT describes the MIT-NLR as an interdepartmental laboratory for interdisciplinary research, which has provided a reliable and safe neutron source and facility. Since its inception, the MIT-NLR has provided opportunities for students to train and conduct cutting-edge research in several areas: nuclear fission engineering, material science, radiation effects in biology and medicine, neutron physics, geochemistry, and environmental studies. Operating a 6MW research reactor known as MITR-II, MIT-NLR is owned and operated by MIT, a non-profit educational institution. MIT is a partner in the Battelle Energy Alliance, which currently operates the Idaho National Laboratory (INL); the MIT-NLR is also a partner reactor facility of the ATR National Scientific User Facility (ATR-NSUF) for advanced materials and fuel research and development to facilitate collaboration among national labs, universities, and industry.

The MURR, located at the Columbia land-grant institution, is a 10MW, internationally recognized reactor and considered to be the most intense neutron source of the other research reactors located on university campuses. Missouri funded the reactor's inception in 1959 with state appropriations. The reactor is operated by staff 6.5 days a week, 52 weeks a year. The facility conducts research across many areas: ancient cultural investigations, plants' responses to their environments, analysis of industrial materials, development of radiopharmaceuticals with life-saving clinical applications, and the like. The university describes the facility as a reliable national resource for researchers, scientists, engineers, and students, with a 50-year safety record.

The PS-NBL is part of Penn State's Radiation Science and Engineering Center (RSEC), which provides safe nuclear analytical and testing facilities in support of research and education activities of faculty, staff, and students. The Center's resources are also available to users from other universities, governmental agencies, and corporations as a part of Penn State's public service as a land grant institution. The PS-NBL, characterized as one of the most used facilities at RSEC, provides well-collimated neutron beams for a variety of neutron beam technique uses. The PS Breazeale Reactor (PSBR), which first went critical in 1955, is the nation's longest continuously operating university research reactor. The PSBR is a 1 MW TRIGA reactor with pulsing capabilities and a moveable core in a large pool. The core sits in a 24-foot deep pool with ~71,000 gallons of demineralized water. When the reactor core is placed next to a D2O (heavy water) tank and a graphite reflector assembly near the beam port locations, thermal neutron beams become

available for neutron transmission and neutron radiography measurements from two of the seven existing beam ports.

5) Neutron research sources and facilities in the private sector

The Dow Chemical Company has been operating its DOW TRIGA Research Nuclear Reactor since the mid-1960s, and provides one example of a small number of private neutron facilities. The reactor is located at DOW Chemical Company, Michigan Division facility in Midland, Michigan. In its 2019 annual report to the U.S. Nuclear Regulatory Commission, it indicated that "the reactor was operated for 1.13 Megawatt-days in 2018 (a decrease from last year) for a total of 218 hours (also a decrease from last year). The main purpose of operations at the Dow facility is to perform neutron activation analysis. About 4,644 samples were irradiated in 2018, down by 35% from last year, 2017 and consistent with the number of licensed operators and focus."[8]

6) Current U.S. neutron measurement capacity

The importance of the continued availability of the neutron facilities located at ORNL, LANL, and NIST, as well as at universities and other educational institutions, cannot be overemphasized. A July 2018 report by the American Physical Society (APS) described the loss of capacity in a network of smaller neutron facilities when compared to the rest of the world:

> The peak of U.S. capacity (based on the number of neutron-scattering instruments) occurred in 1996, when there were 55 scattering instruments available at the nation's major facilities. The last 20 years have seen a net decrease in this capacity, with some fluctuations, as the United States ceased operations at neutron facilities such as HFBR (High Flux Beam Reactor), IPNS (Intense Pulsed Neutron Source), and the BES (Basic Energy Sciences program of the DOE) user program at the Lujan Center. No high-performance research reactor has been commissioned in the United States since 1969, a period of nearly 50 years. On a positive note, the world-leading SNS was constructed at Oak Ridge National Laboratory (ORNL) and commenced operations in 2006. In addition, the National Institute of Standards and Technology (NIST) Center for Neutron Research, with its National Bureau of Standards Reactor, has enjoyed significant expansion of its cold neutron capacity and capability.[9]

[8] *DOW TRIGA Research Reactor Annual Report* 2019.
[9] Neutrons for the Nation, Discovery and Applications while Minimizing the Risk of Nuclear Proliferation, A report by the APS Panel on Public Affairs, July 2018, pp. 11-13.

Although U.S. neutron measurement capacity has increased to some 45 scattering instruments and 3 imaging instruments during the past 20 years, it is still well below the peak U.S. capacity achieved over 20 years ago. Because of the lower capacity, NIST and ORNL facilities are oversubscribed by a factor of 2 to 3. The report further points out that NIST and ORNL neutron-scattering facilities "are essential elements of the U.S. research enterprise."[10] NIST and ORNL neutron facilities maintain their international competitiveness due mainly to "the continual development of technologies that support new, advanced neutron instruments."[11] The U.S. has one-third of the number of European scattering instruments and about one-half of those in the Asia-Pacific region. One key finding of the APL report was that "the United States has lost important capability in neutron R&D in the last two decades and is no longer the world leader. The United States cannot afford to lose its remaining capacity and capability without significant detriment to the quality and quantity of science, engineering, and even medical and manufacturing processes that rely on neutron sources."[12]

And, as further pointed out by *Thomas Industry Update*, "However, neither the U.S. government nor private industries have put further funding in place for new facilities. If this trend continues, the U.S. is destined to fall further behind in engineering, medicine, manufacturing, and other fields."[13]

7) The Program: analysis and quantification of retrospective and prospective economic impacts of investments in U.S. neutron research sources and facilities

This study combines both ***retrospective*** and ***prospective*** economic impact analyses of investments in neutron research sources and facilities in the United States, including federal laboratories, in order to assess how well the availability of neutron sources meets current and future U.S. scientific and technical needs. The study will be very broad in terms of required disciplines and experience, which include, but are not limited to, technology assessment, bibliometric analyses, industry participation analyses, industry survey and data collection techniques, economic modeling, and quantitative and qualitative analyses of economic impacts of neutron research investments.

The goals of this study are to:

1) Identify and analyze research and technology transfer activities of Federal and university labs/facilities that have significantly affected neutron research, and the

[10] Ibid.
[11] Ibid.
[12] Ibid, p. 14.
[13] Why Is Neutron Source Funding Important? *Thomas Industry Update*, March 29, 2019.

development, adoption, and deployment of technologies and infrastructure related to neutron scattering (to include knowledge spillovers, collaborative activities, facility users, visiting researchers, etc.);
2) Assess the technological and economic trends in research, development, adoption, and deployment of neutron-scattering instruments, including demonstrated and anticipated adopters;
3) Conduct a qualitative and quantitative empirical assessment of the national economic impacts attributable to investments in U.S. neutron research sources and facilities, including federal laboratories, such as the NBSR / NCNR, across an array of applications, industries, and supply chains since 1968 and, where possible, delineate the economic impact on a facility-level basis;
4) Estimate the economic benefits that would accrue from maintaining existing U.S. neutron facilities, and in developing and deploying new instrumentation for these facilities, through 2030;
5) Assess the expected U.S. and international government policy response—specific to phases in the R&D cycle, technology transfer efforts, and subsequent scale-up (capital formation)—of future investment in neutron facilities;
6) Identify potential areas for future neutron-scattering research investments that would enhance U.S. competitiveness and national and economic security;
7) Conduct four case studies, two of past and two of ongoing, collaborative efforts in neutron research between a federal and/or university or educational institution laboratory, and academia, private industry, and / or other federal laboratories, including at least one case study of collaboration with the NBSR/NCNR;
8) Broadly disseminate the results of the economic impact assessments through appropriate scientific or technical literature, and through presentations at public meetings or technical events; and
9) Contribute to the development of the next generation of researchers focused on science, R&D, and technology transfer impact analysis.

NIST therefore invites proposals from eligible applicants to assess the economic impacts of prior investments in U.S. neutron research sources and facilities and of meeting critical infrastructure needs through future investments in them, including the NBSR/NCNR. The awardee will characterize the past and current state of neutron research sources and facilities in terms of the research, technology transfer activities, and scientific and technological developments. The awardee will produce qualitative and quantitative economic impact assessments of the investments in neutron research sources and facilities in the United States across an array of applications, industries, and supply chains, and where possible, present the economic impact data on a facility-level basis.

The awardee will also produce case studies analyzing four collaborations in neutron research between a federal laboratory and / or a university or educational institution

laboratory, and academia, private industry, and / or other federal laboratories, including at least one case study of collaboration with the NBSR/NCNR. The analysis will focus on each collaboration separately (past and / or ongoing) to demonstrate the impact of the neutron research facility collaborations with industry, academia, and/or other federal labs over time. Given that the time from initial collaboration in scientific research to the time that technological and scientific developments occur that produce measurable benefits on the economy can vary, and in some cases, be lengthy, it is expected that the bulk of these impacts will result from past collaborations, with marginal benefits (if relevant and appropriate), from ongoing collaborations. Projections of future economic benefits from ongoing collaborations are also relevant to this funding opportunity.

Additionally, the awardee will conduct a literature review and bibliometric analysis that is relevant to the scientific R&D conducted in neutron research sources and facilities to include the private industry and federal research, and technology transfer activities of the facilities that have significantly impacted scientific research and the development, adoption, and deployment of technologies and infrastructure related to the critical need for neutron scattering (to include knowledge spillovers, collaborative activities, facilities users, visiting researchers, etc.).

The awardee is expected to disseminate the results of their work to the public through publications and white papers in appropriate scientific or technical literature, and through presentations at public meetings or technical events. It is expected that awardees will fulfill their obligations consistent with Section C.03 Intellectual Property Rights of the Department of Commerce Financial Assistance Standard Terms and Conditions. See Section VI.2.b) of this NOFO.

II. Federal Award Information

1. Funding Instrument

The funding instrument that will be used is a cooperative agreement. The nature of NIST's "substantial involvement" will generally be collaboration between NIST and the recipient organizations, to include developing and implementing the approved scope of work.

2. Multi-Year Funding Policy. When a proposal for a multi-year award is approved, funding will usually be provided for only the first year of the program. If a project is selected for funding, NIST has no obligation to provide any additional funding in connection with that award. Continuation of an award to increase funding or extend the period of performance is at the sole discretion of NIST. Continued funding will be contingent upon satisfactory performance, continued relevance to the mission and priorities of TPO, and the availability of funds. NIST may choose to fund an award in this program under the multi-year funding policy or to fully fund the award in the first year.

3. Funding Availability

NIST anticipates funding one multi-year award with a budget and performance period of up to two (2) years for up to approximately $800,000, subject to the availability of funds.

III. Eligibility Information

1. Eligible Applicants

Eligibility for all programs listed in this NOFO is open to all non-Federal entities. Eligible applicants include institutions of higher education, non-profit organizations, for-profit organizations, state and local governments, Indian tribes, hospitals, and foreign organizations. An eligible organization may propose to work individually or to include proposed sub-awardees, contractors, or other collaborators. Please note that, for the purposes of this NOFO, individuals and unincorporated sole proprietors are not considered "non-Federal entities" and are not eligible to apply under this NOFO. Although Federal entities are not eligible to receive funding under this NOFO, they may participate as unfunded collaborators.

2. Cost Sharing or Matching. Matching funds are not required.

IV. Application and Submission Information

1. Address to Request Application Package

The application package is available at Grants.gov under Funding Opportunity Number 2020-NIST-TPO-01.

2. Content and Form of Application Submission

a. Required Forms and Documents. The Application must contain the following:

(1) SF-424 (R&R), Application for Federal Assistance. The SF-424 (R&R) must be signed by an authorized representative of the applicant organization.

For SF-424 (R&R), Items 5, 14, and 19, use the Zip Code + 4 format (##### - ####) when addresses are called for.

For SF-424 (R&R), Item 17, the list of certifications and assurances is contained in the SF-424B (item (3) below).

SF-424 (R&R), Item 18. If the SF-LLL, Disclosure of Lobbying Activities form (item (6) below) is applicable, attach it to field 18.

Instructions for filling in the SF-424 (R&R) can be found in the 2020-NIST-TPO-01 Application Instructions document found on Grants.gov, as well as at Instructions SF424 (R&R) Application for Federal Assistance..

(2) Research & Related Budget (Total Fed + Non-Fed). The budget should reflect anticipated expenses for the full term of the project, considering all potential cost increases, including cost of living adjustments.

The budget should be detailed in these categories:

A. Senior/Key Person;
B. Other Personnel;
C. Equipment Description;
D. Travel;
E. Participant/Trainee Support Costs
F. Other Direct Costs;
G. Direct Costs (automatically generated);
H. Indirect Costs;
I. Total Direct and Indirect Costs (automatically generated);
J. Fee (not relevant to this competition);
K. Total Costs and Fee (automatically generated);

L. Budget Narrative and Justification document (item (8) below) should be attached to field L.

A separate detailed R&R Budget must be completed for each budget period during the proposed award (e.g., annual basis). To add additional budget periods (e.g., year 2), click "Add Period" embedded at the end of the form. Instructions for completing the Research & Related Budget (Total Fed + Non-Fed) form can be found in the 2020 NIST-TPO-01 Application Instructions document on Grants.gov, as well as at Instructions R&R Budget (Total Fed + Non-Fed) Budget..

(3) SF-424B, Assurances – Non-Construction Programs (if applicable)**.** The SF-424B is required for all applicants that have not updated their System for Award Management (SAM.gov) entity registration since February 2, 2019 to include the Federal financial assistance certifications and representations (certs and reps). If an applicant has updated their SAM.gov entity registration since February 2, 2019 to include the certifications and representations, then the SF-424B is not required.

(4) CD-511, Certification Regarding Lobbying. Enter "2020-NIST-TPO-01" in the Award Number field. Enter the title of the application, or an abbreviation of that title, in the Project Name field.

(5) Research and Related Other Project Information. Answer the highlighted questions and use this form to attach the Project Narrative (item (7) below), the Indirect Cost Rate Agreement (item (9) below), and the Data Management Plan (item (10) below). Instructions for completing the Research and Related Other Project Information can be found in the 2020-NIST-TPO-01 Application Instructions document on Grants.gov, as well as at Instructions R&R Other Project Information.

Please note that the Project Summary/Abstract is not relevant to this competition. However, Grants.gov requires an attachment to field 7 of the Research and Related Other Project Information form to successfully pass through Grants.gov. Please attach a document to field 7 stating, "A Project Summary/Abstract is not relevant to this competition."

(6) SF-LLL, Disclosure of Lobbying Activities (if applicable).

(7) Project Narrative. The Project Narrative is a word-processed document of no more than twenty (20) pages (double-spaced between lines), which is responsive to the program description (*see* Section I. of this NOFO) and the evaluation criteria (*see* Section V.1. of this NOFO). The projective narrative should contain the following information:

a. Executive Summary. An executive summary of the proposed approach, consistent with the evaluation criteria (see Section V.1. of this NOFO). The executive summary should include information indicating how each evaluation criterion and its sub-factors are addressed. A table can be helpful in providing this information. The executive summary should not exceed two (2) pages.

b. Project Approach. A description of the applicant's approach to clearly address the program goals (1)-(7) (see Section I. of this NOFO). This section should address the Problems, Solutions and Technical Approach evaluation criterion (see Sections V.1.a. of this NOFO).

c. Statement of Work. A complete statement of work covering all aspects of the project, including a schedule of measurable events and milestones as well as measurable performance objectives that can be used to determine the success of the project. This section should address the Statement of Work and Potential Impact of the Results evaluation criterion (see Section V.1.b. of this NOFO).

d. Qualifications. A description of the qualifications of the key personnel, the time commitments of the key personnel, and how the project staff qualifications will enable them to conduct the project work. This section should address the Qualifications and Experience of Key Personnel and Resource Availability evaluation criterion (see Section V.1.d. of this NOFO).

e. Resumes of Key Personnel must be included. Resumes are not included in the page count of the Project Narrative. Resumes included as part of the application must be a maximum of two pages each. Additional pages beyond the two pages per resume will not be considered during the evaluation of the application**.**

f. **Dissemination Plan.** A description of the applicant's approach to clearly address program goals (8)-(9) to broadly disseminate the results of the prospective economic impact assessment to the public. The plan should include an approach to publish results through publications and white papers in appropriate literature, and through presentations at public meetings or technical events. (see Section V.1.c of this NOFO).

g. **Similar Research Applications.** Provide a list of all current and pending applications for similar research, including the amounts requested and the source that was or is considering the applications.

(8) Budget Narrative and Justification.

There is no set format for the Budget Narrative and Justification; however, further explanation must be provided for the specific cost categories and line items identified in the Instructions R&R Budget (Total Fed + Non-Fed) Budget, as well as any other information you deem necessary for NIST's consideration. The Budget Narrative and Justification must be attached to the Research & Related Budget (Total Fed + Non-Fed).

The written justification should include the necessity and the basis for the cost. Proposed funding levels must be consistent with the project scope, and only allowable costs should be included in the budget. Information on cost allowability is available in the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards at 2 C.F.R. Part 200 (http://go.usa.gov/SBYh), which apply to awards in this program.

The Budget Narrative does not count against the twenty (20) page limit of the Project Narrative.

This section will be evaluated in accordance with the Budget Narrative evaluation criteria (see Section V.1.e. of this NOFO). It will also be reviewed to determine if all costs are reasonable, allocable, and allowable under 2 C.F.R. Part 200 Subpart E, Cost Principles.

Information needed for each category is as follows:

A. **Senior/Key Person** – At a minimum, the budget justification should

include the following: name, job title, commitment of effort on the proposed project in terms of average number of hours per week or percentage of time, salary rate, total direct charges on the proposed project, description of the role of the individual on the proposed project and the work to be performed.

Fringe benefits should be identified separately from salaries and wages and based on rates determined by organizational policy. The items included in the fringe benefit rate (e.g., health insurance, parking, etc.) should not be charged under another cost category.

B. Other Personnel - Data is requested at the project role level, and not at the individual level for Other Personnel. The budget justification should include the following: job title, commitment of effort on the proposed project in terms of average number of hours per week or percentage of time, salary rate, total direct charges on the proposed project, description of the role of the position on the proposed project and the work to be performed.

Fringe benefits should be identified separately from salaries and wages and based on rates determined by organizational policy. The items included in the fringe benefit rate (e.g., health insurance, parking, etc.) should not be charged under another cost category.

C. Equipment Description – Equipment is defined as an item of property that has an acquisition cost of $5,000 or more (unless the organization has established lower levels) and an expected service life of more than one year. The budget justification should list each piece of equipment, the cost, and a description of how it will be used and why it is necessary to the successful completion of the proposed project. Please note that any general use equipment (computers, etc.) charged directly to the award should be allocated to the award according to expected usage on the project. Applicants should provide at least two (2) quotes, if available, for equipment costing $25,000 or more. If two (2) quotes are not available, please provide a statement as to why two (2) quotes are not available. Any items that do not meet the threshold for equipment can be included under the Materials and Supplies line item in Section F, Other Direct Costs.

D. Travel - For all travel costs, required by the recipient to complete

the project, including attendance at any relevant conferences, the budget justification for travel should include the following: destination; names or number of people traveling; dates and/or duration; mode of transportation, lodging and subsistence rates; and description of how the travel is directly related to the proposed project. For travel that is yet to be determined, please provide best estimates based on prior experience. If a destination is not known, an approximate amount may be used with the assumptions given for the location of the meeting.

E. Participant/Trainee Support Costs – Participant support costs are stipends, subsistence allowances, travel, and registration fees paid to or on behalf of participants or trainees, who are not employees of your organization, for conferences or training projects. The budget justification should indicate the names or number of participants or trainees, a description and calculation of costs per person, a description and date of the event, and a description of why the cost is necessary for the successful completion of the proposed project.

F. Other Direct Costs – For costs that do not easily fit into the other cost categories, please list the cost, and the breakdown of the total costs by quantity or unit of cost. Include the necessity of the cost for the completion of the proposed project. Only allowable costs can be charged to the award.

Each subaward or contractual cost should be treated as a separate item in the Other Direct Costs category. Describe the services to be provided and the necessity of the subaward or contract to the successful performance of the proposed project. Contracts are for obtaining goods and services. Subawardees perform part of the project scope of work. For each subaward, applicants must provide budget detail justifying the cost of the work performed on the project.

H. Indirect Costs – Commonly referred to as Facilities & Administrative Costs, Indirect Costs are defined as costs incurred by the applicant organization that cannot otherwise be directly assigned or attributed to a specific project. For more details, *see* Section IV.2.b.(9) of this NOFO.

(9) Indirect Cost Rate Agreement. If indirect costs are included in the proposed budget, provide a copy of the approved negotiated

agreement if this rate was negotiated with a cognizant Federal audit agency. If the rate was not established by a cognizant Federal audit agency, provide a statement to this effect. If the successful applicant includes indirect costs in the budget and has not established an indirect cost rate with a cognizant Federal audit agency, the applicant will be required to obtain such a rate in accordance with Section B.06 of the Department of Commerce Financial Assistance Standard Terms and Conditions, dated April 30, 2019.

Alternatively, in accordance with 2 C.F.R. § 200.414(f), applicants that have never received a negotiated indirect cost rate may elect to charge indirect costs to an award pursuant to a de minimis rate of 10 percent of modified total direct costs (MTDC), in which case a negotiated indirect cost rate agreement is not required. Applicants proposing a 10 percent de minimis rate pursuant to 2 C.F.R. § 200.414(f) should note this election as part of the budget portion of the application.

(10) Data Management Plan. Consistent with NIST Policy 5700.00[14], *Managing Public Access to Results of Federally Funded Research,* and NIST Order 5701.00[15], *Managing Public Access to Results of Federally Funded Research*", applicants must include a Data Management Plan (DMP).

The DMP is a supplementary document of not more than two pages that must include, at a minimum, a summary of proposed activities that are expected to generate data, a summary of the types of data expected to be generated by the identified activities, a plan for storage and maintenance of the data expected to be generated by the identified activities, and a plan describing whether and how data generated by the identified activities will be reviewed and made available to the public. As long as the DMP meets these NIST requirements, it may take the form specified by the applicant's institution or some other entity (e.g., the National Science Foundation[16] or the National Institutes of Health[17]).

All applications for activities that will generate scientific data using NIST funding are required to submit a DMP or explain why data sharing and/or preservation are not within the scope of the project.

[14] https://www.nist.gov/system/files/documents/2018/06/19/final_p_5700.pdf
[15] https://www.nist.gov/system/files/documents/2019/11/08/final_o_5701_ver_2.pdf
[16] http://www.nsf.gov/bfa/dias/policy/dmp.jsp
[17] http://grants.nih.gov/grants/policy/data_sharing/data_sharing_guidance.htm

For the purposes of the DMP, NIST adopted the definition of "research data" at 2 C.F.R. § 200.315(e)(3) (available at http://go.usa.gov/3sZvQ).

Reasonable costs for data preservation and access may be included in the application.

The inclusion of the DMP will be considered as part of the administrative review (*see* Section V.3.a. of this NOFO); however, the DMP will not be evaluated against any evaluation criteria.

(11) Subaward Budget Form. The Research & Related Subaward Budget Attachment Form is required if sub-recipients and contractors are included in the application budget.

Instructions for completing subaward budget forms are available by visiting the R & R Family section of the Grants.gov Forms Repository and scrolling down to the R & R Subaward Budget Attachment(s) Form and selecting "Instructions."

(12) Current and Pending Support Form. Any application that includes investigators, researchers, and key personnel must identify all sources of current and potential funding, including this proposal. Any current project support (e.g., Federal, state, local, public or private foundations, etc.) must be listed on this form. The proposed project and all other projects or activities requiring a portion of time of the Principal Investigator (PI), co-PI, and key personnel must be included, even if no salary support is received. The total award amount for the entire award period covered, including indirect costs, must be shown as well as the number of person-months per year to be devoted to the project, regardless of the source of support. Similar information must be provided for all proposals already submitted or that are being submitted concurrently to other potential funders.

Applicants must complete the Current and Pending Support Form, using multiple forms as necessary to account for all activity for each individual identified in the PI, co-PI and key personnel roles. A separate form should be used for each identified individual.

Applicants must download the Current and Pending Support Form from the NIST website at https://www.nist.gov/oaam/grants-management-division/current-and-pending-support and reference the guidance

provided as it contains information to assist with accurately completing the form.

b. Attachment of Required Documents

Items IV.2.a.(1) through IV.2.a.(5) above are part of the standard application package in Grants.gov and can be completed through the download application process.

Item IV.2.a.(6), the SF-LLL, Disclosure of Lobbying Activities form, is an optional application form which is part of the standard application package in Grants.gov. If item IV.2.a.(6), the SF-LLL, Disclosure of Lobbying Activities form is applicable to this proposal, attach it to field 18 of the SF-424 (R&R), Application for Federal Assistance.

Item IV.2.a.(7), the Project Narrative, should be attached to field 8 (Project Narrative) of the Research and Related Other Project Information form by clicking on “Add Attachment”.

Item IV.2.a.(8), the Budget Narrative and Justification, should be attached to field L (Budget Justification) of the Research and Related Budget (Total Fed + Total Non-Fed) form by clicking on “Add Attachment”.

Items IV.2.a.(9), the Indirect Cost Rate Agreement, IV.2.a.(10), the Data Management Plan, and IV.2.a.(12), the Current and Pending Support Form, must be completed and attached by clicking on “Add Attachments” found in item 12 (Other Attachments) of the Research and Related Other Project Information form.

Item IV.2.a.(11), the Subaward Budget Form(s), if applicable to the submission, should be attached to the Research & Related Subaward Budget (Total Fed + Non-Fed) Attachment(s) Form in the application package.

Following these directions will create zip files which permit transmittal of the documents electronically via Grants.gov.

Applicants should carefully follow specific Grants.gov instructions to ensure the attachments will be accepted by the Grants.gov system. A receipt from Grants.gov indicates only that an application was transferred to a system. It does not provide details concerning whether all attachments (or how many attachments) transferred successfully. Applicants will receive a series of e-mail messages over a period of up to

two business days before learning whether a Federal agency's electronic system has received its application.

Applicants are strongly advised to use Grants.gov's "Download Submitted Forms and Applications" option to check that their application's required attachments were contained in their submission.

After submitting the application, check the status of your application here: CHECK APPLICATION STATUS . If any, or all, of the required attachments are absent from the submission, follow the attachment directions found above, resubmit the application, and check again for the presence of the required attachments.

If the directions found at https://www.grants.gov/help/html/help/index.htm#t=GetStarted%2FGetStarted.htm are not effective, please contact the Grants.gov Help Desk immediately. If calling from within the United States or from a U.S. territory, please call 800-518-4726. If calling from a place outside the United States or a U.S. territory, please call 606-545-5035. E-mails should be addressed to support@grants.gov. Assistance from the Grants.gov Help Desk will be available around the clock every day, with the exception of Federal holidays. Help Desk service will resume at 7:00 a.m. Eastern Time the day after Federal holidays.

Applicants can track their submission in the Grants.gov system by following the procedures at the Grants.gov site (http://go.usa.gov/cjamz). It can take up to two business days for an application to fully move through the Grants.gov system to NIST.

NIST uses the Tracking Numbers assigned by Grants.gov, and does not issue Agency Tracking Numbers.

c. Application Format

(1) Paper, Email, and Facsimile (fax) Submissions. Will not be accepted.

(2) Figures, Graphs, Images, and Pictures. Should be of a size that is easily readable or viewable and may be displayed in landscape orientation. Any figures, graphs, images, or pictures will count toward the page limits for the Project Narrative.

(3) Font. Easy to read font (10-point minimum). Smaller type may be used in figures and tables but must be clearly legible.

(4) Page Limit. The Project Narrative is limited to twenty (20) pages double spaced, noting the limit of two (2) pages for the Executive Summary. Resumes are not included in the page count of the Project Narrative. However, if resumes are included, resumes must be a maximum of two (2) pages each.

(5) Page Limit Exclusions:
SF-424 (R&R), Application for Federal Assistance;
SF-424B, Assurances – Non-Construction Programs;
CD-511, Certification Regarding Lobbying;
SF-LLL, Disclosure of Lobbying Activities;
Budget Narrative and Justification;
Indirect Cost Rate Agreement;
Data Management Plan;
Subaward Budget Form;
Current and Pending Support Form

(6) Page Layout. The Proposal must be in portrait orientation.

(7) Page size. 21.6 centimeters by 27.9 centimeters (8 ½ inches by 11 inches).

(8) Page numbering. Number pages sequentially.

(9) Application language. English. All documents must be in English, including but not limited to the initial application, any additional documents submitted in response to a NIST request, all reports, and any correspondence with NIST.

(10) Typed document. All applications, including forms, must be typed; handwritten forms will not be accepted.

d. Application Replacement Pages. Applicants may not submit replacement pages and/or missing documents once an application has been submitted. Any revisions must be made by submission of a new application that must be received by NIST by the submission deadline.

e. Pre-Applications. Pre-applications will not be accepted under this NOFO.

f. Certifications Regarding Federal Felony and Federal Criminal Tax Convictions, Unpaid Federal Tax Assessments and Delinquent Federal Tax Returns. In accordance with Federal appropriations law, an authorized representative of the selected applicant(s) may be required to provide certain pre-award certifications regarding federal felony and federal criminal tax convictions, unpaid federal tax assessments, and delinquent federal tax returns.

3. **Unique Entity Identifier and System for Award Management (SAM).** Pursuant to 2 C.F.R. part 25, applicants and recipients are required to: (i) be registered in SAM before submitting its application; (ii) provide a valid unique entity identifier in its application; and (iii) continue to maintain an active SAM registration with current information at all times during which it has an active Federal award or an application or plan under consideration by a Federal awarding agency, unless otherwise excepted from these requirements pursuant to 2 C.F.R. § 25.110. NIST will not make a Federal award to an applicant until the applicant has complied with all applicable unique entity identifier and SAM requirements and, if an applicant has not fully complied with the requirements by the time that NIST is ready to make a Federal award pursuant to this NOFO, NIST may determine that the applicant is not qualified to receive a Federal award and use that determination as a basis for making a Federal award to another applicant.

4. **Submission Dates and Times**

Applications must be received at Grants.gov no later than 11:59 p.m. Eastern Time, Wednesday, August 5, 2020. NIST will consider the date and time recorded by Grants.gov as the official submission time. Applications received after this deadline will not be reviewed or considered. Paper applications will not be accepted.

Applicants should be aware, and factor in their application submission planning, that the Grants.gov system is expected to be closed for routine maintenance at the following times. Applications cannot be submitted when Grants.gov is closed:

From 12:01 A.M. Eastern Time Saturday	To 6:00 A.M. Eastern Time Monday
June 20, 2020	June 22, 2020
July 18, 2020	July 20, 2020

When developing the submission timeline, please keep in mind that: (1) all applicants are required to have current registrations in the electronic System for Award Management (SAM.gov) and Grants.gov; (2) the free annual registration process in the SAM.gov (*see* Sections IV.3. and IV.7.a.(1).(b). of this NOFO)

generally takes between three and five business days but can take more than two weeks; and applicants will receive e-mail notifications over a period of up to two business days as the application moves through intermediate systems before the applicant learns via a validation or rejection notification whether NIST has received the application. (See Grants.gov for full information on application and notification through Grants.gov.) Please note that a Federal assistance award cannot be issued if the designated recipient's registration in the System for Award Management (SAM.gov) is not current at the time of the award.

5. **Intergovernmental Review**
   Applications under this Program are not subject to Executive Order 12372.

6. **Funding Restrictions**
   Applications for product development and/or commercialization are not considered responsive to this NOFO. Profit or fee is not an allowable cost.

7. **Other Submission Requirements**

   a. **Applications must be submitted electronically.**

      (1) Applications must be submitted at Grants.gov.

      (a) Applicants should carefully follow specific Grants.gov instructions to ensure that all attachments will be accepted by the Grants.gov system. A receipt from Grants.gov indicating an application is received does not provide information about whether attachments have been received. For further information or questions regarding applying electronically for the 2020-NIST-TPO-01 announcement, contact the Grants.gov Help Desk at 800-518-4726.

      (b) Applicants are strongly encouraged to start early and not wait until the approaching due date before logging on and reviewing the instructions for submitting an application through Grants.gov. The Grants.gov registration process must be completed before a new registrant can apply electronically. The typical registration process takes three to five business days. If problems are encountered, the registration process can take two weeks or more. Applicants must have a valid unique entity identifier number and must maintain a current registration in the Federal government's primary registrant database, the System for Award Management (https://www.sam.gov/), as explained on the Grants.gov Web site (also *see* Section IV.3. of this NOFO). After registering, it may take

several days or longer from the initial log-on before a new Grants.gov system user can submit an application. Only individuals authorized as organization representatives will be able to submit the application, and the system may need time to process a submitted application. Applicants should save and print the proof of submission they receive from Grants.gov. If problems occur while using Grants.gov, the applicant is advised to (a) print any error message received and (b) call Grants.gov directly for immediate assistance. If calling from within the United States or from a U.S. territory, please call 800-518-4726. If calling from a place other than the United States or a U.S. territory, please call 606-545-5035. Assistance from the Grants.gov Help Desk will be available around the clock every day, except for Federal holidays. Help Desk service will resume at 7:00 a.m. Eastern Time the day after Federal holidays. For assistance using Grants.gov, the applicant may also contact support@grants.gov.

(c) To find instructions for submitting an application on Grants.gov, applicants should refer to the "Applicants" tab in the banner just below the top of the Grants.gov home page. Clicking on the "Applicants" tab produces two exceptionally useful sources of information, Applicant Actions and Applicant Resources, which applicants are advised to review.

Applicants will receive a series of e-mail messages over a period of up to two business days before learning whether a Federal agency's electronic system has received its application.

Applicants should pay close attention to the guidance under Grants.gov's "Applicant FAQs,"as it contains information important to successful submission, including essential details on the naming conventions for attachments to applications.

All applicants should be aware that adequate time must be factored into applicants' schedules for delivery of their application. Applicants are advised that volume on Grants.gov may be extremely heavy leading up to the deadline.

The application must be both received and validated by Grants.gov. The application is "received" when Grants.gov provides the applicant a confirmation of receipt and an application tracking number. If an applicant does not see this confirmation and tracking number, the application has not been received. After the application

has been received, it must still be validated. During this process, it may be "validated" or "rejected with errors". To ascertain whether the application was rejected with errors and the reasons for the rejection, the applicant must log in to Grants.gov, select "Applicants" from the top navigation, and select "Track my application" from the drop-down list. If the status is "rejected with errors," the applicant may still seek to correct the errors and resubmit the application before the deadline. If the applicant does not correct the errors, the application will not be forwarded to NIST by Grants.gov.

Refer to important information in Section IV.4. Submission Dates and Times, to help ensure the application is received on time.

b. Amendments. Any amendments to this NOFO will be announced through Grants.gov. Applicants may sign up on Grants.gov to receive amendments by e-mail or may request copies by e-mail from kathleen.mctigue@nist.gov.

V. Application Review Information

1. Evaluation Criteria: The evaluation criteria that will be used in evaluating applications and their assigned weights are as follows:

a. Problems, Solutions and Technical Approach. (0-45 points) Reviewers will evaluate the extent to which the applicant's proposed approach clearly addresses the program goals (1)-(7) (*see* Section I. of this NOFO); specifically, reviewers will evaluate the likelihood and extent to which the proposed methodologies will result in efficiently and effectively conducting the following activities:

1) Identify and analyze research and technology transfer activities of federal and university or educational institution labs / facilities that have significantly affected neutron research, and the development, adoption, and deployment of technologies and infrastructure related to neutron scattering (to include knowledge spillovers, publications, collaborative activities, facilities users, visiting researchers, etc.);

2) Assess the technological and economic trends in research, development, adoption, and deployment of neutron-scattering instruments, including demonstrated and anticipated adopters;

3) Conduct a qualitative and quantitative empirical assessment of national economic impacts attributable to investments in U.S. neutron research sources and facilities, including federal labs, such as the NBSR / NCNR, across an array of applications, industries, and supply chains since 1968 and, where possible, delineate the economic impact on a facility-level basis;

4) Estimate the economic benefits that would accrue from maintaining existing U.S. neutron facilities, and in developing and deploying new instrumentation for these facilities, through 2030;

5) Assess the expected U.S. and international government policy response—specific to phases in the R&D cycle, technology transfer efforts, and subsequent scale-up (capital formation)—of future investment in neutron facilities;

6) Identify potential areas for future neutron-scattering research investments that would enhance U.S. competitiveness and national and economic security; and

7) Conduct four case studies, two of past and two of ongoing, collaborative efforts in neutron research between a federal and/or university or educational institution laboratory, and academia, private industry, and / or other federal laboratories, including at least one case study of collaboration with the NBSR/NCNR.

b. Statement of Work and Potential Impact of the Results. (0-20 points)

(1) Reviewers will evaluate the appropriateness, quality, reasonableness, and completeness of the applicant's statement of work, including the plans to manage the project tasks, timeline, and work of all project staff, to ensure realization of project goals and objectives.

c. Development of the Scientific Field. (0-10 points) Reviewers will evaluate the extent to which the fields of science, R&D, and technology transfer impact analysis are likely to be positively impacted by applicant's plan in response to program goals (8) and (9) (*see* Section I. of this NOFO) for:

(1) Broadly disseminate the results of the economic impact assessments, through appropriate scientific or technical literature, and through presentations at public meetings or other technical events, and
(2) Contribute to the development of the next generation of researchers focused on science, R&D, and technology transfer impact analysis.

d. Qualifications and Experience of Key Personnel and Resources Availability. (0-15 points)

(1) Reviewers will evaluate the appropriateness and extent of the qualifications and experience of the key personnel and proposed staff, to assess the likelihood of achieving the objectives of the project. In particular, for key personnel, the following will be evaluated for their adequacy and the extent to which they are likely to contribute to the overall success of the project:

- any past experience with evaluating the economic impact of the technology infrastructure;
- Any past experience in conducting prospective economic impact studies;
- any past experience in the following disciplines: technology assessment, high-tech industry behavioral and structural analyses, microeconomic modeling of complex technology development and commercialization patterns, high-tech industry survey and data collection techniques, and quantitative and qualitative analyses of technology infrastructure gaps that are inhibiting the advancement of technologies; and
- any previously demonstrated ability to achieve positive outcomes in endeavors with program objectives that are similar to those of this NOFO as described in Section I. of this NOFO.

e. Budget Narrative. (0-10 points). Reviewers will assess the budgeted costs against the proposed activities to determine the feasibility of the proposed budget with respect to developing and implementing the proposed project.

2. Selection Factors

a. The Selecting Official, the Director of the Technology Partnerships Office, or designee, will make a final award recommendation to the NIST Grants Officer. The Selecting Official shall generally select an application for

award based on the rank order of the applications (*see* Section V.3. of this NOFO) and on one or more of the following selection factors:

(1) Results of the merit reviewers' evaluations.
(2) The availability of funding.
(3) Whether the project duplicates other projects funded by NIST or other Federal agencies.
(4) Alignment with the NOFO objectives.

3. Review and Selection Process

Proposals, reports, documents and other information related to applications submitted to NIST and/or relating to financial assistance awards issued by NIST will be reviewed and considered by Federal employees, or non-Federal personnel who have entered into conflict of interest and confidentiality agreements covering such information, when applicable.

a. Initial Administrative Review of Applications. Applications received by the deadline will be reviewed to determine eligibility, completeness, and responsiveness to this NOFO and to the scope of the stated program objectives (*see* Section I. of this NOFO). Applications determined to be ineligible, incomplete, and/or nonresponsive may be eliminated from further review. However, NIST, in its sole discretion, may continue the review process for an application that is missing non-substantive information, the absence of which may easily be rectified during the review process.

b. Full Review of Eligible, Complete, and Responsive Applications. Applications that are determined to be eligible, complete, and responsive will proceed for full reviews in accordance with the review and selection process below:

(1) Merit Review. At least three (3) objective reviewers, who may be Federal employees or non-Federal personnel, with appropriate professional and technical expertise relating to the topics covered in this NOFO, will evaluate and score each eligible, complete, and responsive application based on the evaluation criteria (*see* Section V.1. of this NOFO). While every application will have at least three (3) reviewers, applications may have more than three (3) reviewers if specialized expertise is needed to evaluate an application. During the review process, the reviewers may discuss the applications with each other, but scores will be determined on an individual basis. Based on the numerical average of the reviewers' scores, a rank

order will be prepared and provided to the Selecting Official for further consideration.

(2) Selection. The Selecting Official will make final award recommendations to the NIST Grants Officer. The Selecting Official shall generally select and recommend the most meritorious application for an award based upon the rank order of the applications. The Selecting Official retains the discretion to select and recommend an application out of order based on the Selection Factors (see Section V.2. of this NOFO).

NIST reserves the right to negotiate the budget costs with any applicant selected to receive an award, which may include requesting that the applicant removes certain costs. Additionally, NIST may request that successful applicants modify objectives or work plans and provide supplemental information required by the agency prior to award. NIST also reserves the right to reject an application where information is uncovered that raises a reasonable doubt as to the responsibility of the applicant. NIST may select some, all, or none of the applications, or part(s) of any application. The final approval of selected applications and issuance of awards will be by the NIST Grants Officer. The award decisions of the NIST Grants Officer are final.

c. Federal Awarding Agency Review of Risk Posed by Applicants. After applications are proposed for funding by the Selecting Official, the NIST Grants Management Division (GMD) performs pre-award risk assessments in accordance with 2 C.F.R. § 200.205, which may include a review of the financial stability of an applicant, the quality of the applicant's management systems, the history of performance, and/or the applicant's ability to effectively implement statutory, regulatory, or other requirements imposed on non-Federal entities.

In addition, prior to making an award where the total Federal share is expected to exceed the simplified acquisition threshold (currently $250,000), NIST GMD will review and consider the publicly available information about that applicant in the Federal Awardee Performance and Integrity Information System (FAPIIS). An applicant may, at its discretion, review and comment on information about itself previously entered into FAPIIS by a Federal awarding agency. As part of its review of risk posed by applicants, NIST GMD will consider any comments made by the applicant in FAPIIS in making its determination about the applicant's

integrity, business ethics, and record of performance under Federal awards. Upon completion of the pre-award risk assessment, the Grants Officer will make a responsibility determination concerning whether the applicant is qualified to receive the subject award and, if so, whether appropriate specific conditions that correspond to the degree of risk posed by the applicant should be applied to an award.

4. **Anticipated Announcement and Award Date**
Review of applications, selection of successful applicants, and award processing is expected to be completed by November 2020. The earliest start date for awards under this NOFO is expected to be November 2020.

5. **Additional Information**

   a. **Safety**. Safety is a top priority at NIST. Employees and affiliates of award recipients who conduct project work at NIST will be expected to be safety-conscious, to attend NIST safety training, and to comply with all NIST safety policies and procedures, and with all applicable terms of their guest research agreement.

   b. **Notification to Unsuccessful Applicants.** Unsuccessful applicants will be notified by e-mail and will have the opportunity to receive a debriefing after the opportunity is officially closed. Applicants must request within 10 business days of the email notification to receive a debrief from the program office. The program office will then work with the unsuccessful applicant in arranging a date and time of the debrief.

   d. **Retention of Unsuccessful Applications.** Unsuccessful applications will be retained in accordance with the General Record Schedule 1.2/021.

VI. Federal Award Administration Information

1. **Federal Award Notices.** Successful applicants will receive an award package from the NIST Grants Officer.

2. **Administrative and National Policy Requirements**

   a. **Uniform Administrative Requirements, Cost Principles and Audit Requirements.** Through 2 C.F.R. § 1327.101, the Department of Commerce adopted Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards at 2 C.F.R. Part 200, which apply to awards in this program. Refer to http://go.usa.gov/SBYh and http://go.usa.gov/SBg4.

b. **Department of Commerce Financial Assistance Standard Terms and Conditions.** The Department of Commerce will apply to each award in this program, the Financial Assistance Standard Terms and Conditions in effect on the date of award. The current version, dated April 30, 2019, is accessible here. Refer to Section VII. of this NOFO, Federal Awarding Agency Contacts, Grant Rules and Regulations, if you need more information.

c. **Pre-Award Notification Requirements.** The Department of Commerce will apply the Pre-Award Notification Requirements for Grants and Cooperative Agreements dated December 30, 2014 (79 FR 78390), accessible at http://go.usa.gov/hKkR. Refer to Section VII. of this NOFO, Federal Awarding Agency Contacts, Grant Rules and Regulations, for more information.

d. **Funding Availability and Limitation of Liability.** Funding for the program listed in this NOFO is contingent upon the availability of appropriations. NIST or the Department of Commerce will not be responsible for application preparation costs, including but not limited to if this program fails to receive funding or is cancelled because of agency priorities. Publication of this NOFO does not oblige NIST or the Department of Commerce to award any specific project or to obligate any available funds.

e. **Collaborations with NIST Employees.** If an applicant proposes collaboration with NIST, the statement of work should include a statement of this intention, a description of the collaboration, and prominently identify the NIST employee(s) involved, if known. Any collaboration by a NIST employee must be approved by appropriate NIST management and is at the sole discretion of NIST. Prior to beginning the merit review process, NIST will verify the approval of the proposed collaboration. Any unapproved collaboration will be stricken from the application prior to the merit review. Any collaboration with an identified NIST employee that is approved by appropriate NIST management will not make an application more or less favorable in the competitive process.

f. **Use of Government-Owned Intellectual Property.** If the applicant anticipates using any Government-owned intellectual property to carry out the work proposed, the applicant should identify such intellectual property. This information will be used to ensure that no Federal employee involved in the development of the intellectual property will participate in the review

process for that competition. In addition, if the applicant intends to use Government-owned intellectual property, the applicant must comply with all statutes and regulations governing the licensing of Federal government patents and inventions, described in 35 U.S.C. §§ 200-212, 37 C.F.R. Part 401, 2 C.F.R. §200.315, and in Section C.03 of the Department of Commerce Financial Assistance Terms and Conditions dated April 30, 2019. Questions about these requirements may be directed to the Chief Counsel for NIST, (301) 975-2803, nistcounsel@nist.gov.

Any use of government-owned intellectual property by a recipient of an award under this announcement is at the sole discretion of the Federal Government and will be negotiated on a case-by-case basis if a project is deemed meritorious. The applicant should indicate within the statement of work whether it already has a license to use such intellectual property or whether it intends to seek one.

If any inventions made in whole or in part by a Federal employee arise in the course of an award made pursuant to this NOFO, the United States Government may retain its ownership rights in any such invention. Licensing or other disposition of Federal Government's rights in such inventions will be determined solely by the Federal Government, and include the possibility of the Federal Government putting the intellectual property into the public domain.

3. Reporting

a. Reporting Requirements. The following reporting requirements described in Sections A.01, Reporting Requirements, of the Department of Commerce Financial Assistance Standard Terms and Conditions, dated April 30, 2019, apply to awards in this program:

(1) Financial Reports. Each award recipient will be required to submit an SF-425, Federal Financial Report on a semi-annual basis for the periods ending March 31 and September 30 of each year. Reports will be due within 30 days after the end of the reporting period to the NIST Federal Program Officer, Grants Officer and Grants Specialist named in the award documents. A final financial report is due within 90 days after the end of the project period.

(2) Research Performance Progress Report (RPPR). Each award recipient will be required to submit a RPPR to the Federal Program Officer, NIST Grants Officer and Grants Specialist named in the award

documents on a semi-annual basis for the periods ending March 31 and September 30 of each year. Reports will be due within 30 days after the end of the reporting period. The RPPR shall conform to the requirements in 2 C.F.R. § 200.328 (http://go.usa.gov/xkVgP) and Department of Commerce Financial Assistance Standard Terms and Conditions, Section A.01.

A final RPPR shall be submitted within 90 days after the expiration date of the award, and publication citation information as well as links to publicly available data shall be submitted as soon as they become available.

If a recipient's Data Management Plan (DMP) has changed since their last submission of a technical progress report, the recipient must include their revised DMP in the next technical progress report following the revision to the DMP. The revised DMP must include all the requirements described in Section IV.2.a.(10). of this NOFO.

(3) Patent and Property Reports. From time to time, and in accordance with the Uniform Administrative Requirements (*see* Section VI.2. of this NOFO) and other terms and conditions governing the award, the recipient may need to submit property and patent reports.

(4) Recipient Integrity and Performance Matters. In accordance with section 872 of Public Law 110-417 (as amended; see 41 U.S.C. 2313), if the total value of a recipient's currently active grants, cooperative agreements, and procurement contracts from all Federal awarding agencies exceeds $10,000,000 for any period of time during the period of performance of an award made under this NOFO, then the recipient shall be subject to the requirements specified in Appendix XII to 2 C.F.R. Part 200, http://go.usa.gov/cTBwC, for maintaining the currency of information reported to SAM that is made available in FAPIIS about certain civil, criminal, or administrative proceedings involving the recipient.

b. Audit Requirements. The Department of Commerce Financial Assistance Standard Terms and Conditions, Section D.01, and 2 C.F.R. Part 200 Subpart F, adopted by the Department of Commerce through 2 C.F.R. § 1327.101, require any non-Federal entity (i.e., including non-profit institutions of higher education and non-profit organizations) that expends Federal awards of $750,000 or more in the recipient's fiscal year to conduct a single or program specific audit in accordance with the

requirements set out in the Subpart. Additionally, unless otherwise specified in the terms and conditions of the award, entities that are not subject to Subpart F of 2 C.F.R. Part 200 (e.g., for-profit commercial entities) that expend $750,000 or more in DOC funds during their fiscal year must submit to the Grants Officer either: (i) a financial related audit of each DOC award or subaward in accordance with Generally Accepted Government Auditing Standards; or (ii) a project specific audit for each award or subaward in accordance with the requirements contained in 2 C.F.R. § 200.507. Applicants are reminded that NIST, the Department of Commerce Office of Inspector General, or another authorized Federal agency may conduct an audit of an award at any time.

c. **Federal Funding Accountability and Transparency Act of 2006.** In accordance with 2 C.F.R. Part 170, all recipients of a Federal award made on or after October 1, 2010, are required to comply with reporting requirements under the Federal Funding Accountability and Transparency Act of 2006 (Public Law No. 109-282). In general, all recipients are responsible for reporting sub-awards of $25,000 or more. In addition, recipients that meet certain criteria are responsible for reporting executive compensation. Applicants must ensure they have the necessary processes and systems in place to comply with the reporting requirements should they receive funding. Also see the Federal Register notice published September 14, 2010, at 75 FR 55663 available here http://go.usa.gov/hKnQ.

VII. Federal Awarding Agency Contacts

Questions should be directed to the following:

Subject Area	Point of Contact
Programmatic and Technical Questions	Kathleen McTigue Phone: 301-975-8530 E-mail: kathleen.mctigue@nist.gov with "2020-NIST-TPO-01" in subject line
Technical Assistance with Grants.gov Submissions	grants.gov Phone: 800-518-4726 E-mail: support@grants.gov
Grant Rules and Regulations	Dean Iwasaki Phone: 301-975-8449 E-mail: dean.iwasaki@nist.gov

VIII. Other Information

1. Personal and Business Information

The applicant acknowledges and understands that information and data contained in applications for financial assistance, as well as information and data contained in financial, performance and other reports submitted by applicants, may be used by the Department of Commerce in conducting reviews and evaluations of its financial assistance programs. For this purpose, applicant information and data may be accessed, reviewed and evaluated by Department of Commerce employees, other Federal employees, and also by Federal agents and contractors, and/or by non-Federal personnel, all of whom enter into appropriate conflict of interest and confidentiality agreements covering the use of such information. As may be provided in the terms and conditions of a specific financial assistance award, applicants are expected to support program reviews and evaluations by submitting required financial and performance information and data in an accurate and timely manner, and by cooperating with Department of Commerce and external program evaluators. In accordance with 2 C.F.R. § 200.303(e), applicants are reminded that they must take reasonable measures to safeguard protected personally identifiable information and other confidential or sensitive personal or business information created or obtained in connection with a Department of Commerce financial assistance award.

In addition, Department of Commerce regulations implementing the Freedom of Information Act (FOIA), 5 U.S.C. Sec. 552, are found at 15 C.F.R. Part 4, Public Information. These regulations set forth rules for the Department regarding making requested materials, information, and records publicly available under the FOIA. Applications submitted in response to this Federal Funding Opportunity may be subject to requests for release under the Act. If an application contains information or data that the applicant deems to be confidential commercial information that should be exempt from disclosure under FOIA, that information should be identified, bracketed, and marked as Privileged, Confidential, Commercial or Financial Information. In accordance with 15 CFR § 4.9, the Department of Commerce will protect from disclosure confidential business information contained in financial assistance applications and other documentation provided by applicants to the extent permitted by law.