March 7, 2016

ANNOUNCEMENT OF FEDERAL FUNDING OPPORTUNITY (FFO)
Economic Impact of the Nation's Precision Timing Infrastructure:
The Global Positioning System

EXECUTIVE SUMMARY

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

- **Funding Opportunity Title:** Economic Impact of the Nation's Precision Timing Infrastructure: The Global Positioning System

- **Announcement Type:** Initial

- **Funding Opportunity Number:** 2016-NIST-TPO-01

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

- **Dates:** Applications must be received no later than 11:59 p.m. Eastern Time, Friday, May 6, 2016. Applications received after this deadline will not be reviewed or considered. 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 these times: from 12:01 a.m. Eastern Time, Saturday, March 19, 2016 until Monday, March 21, 2016 at 6:00 a.m. Eastern Time, and from 12:01 a.m. Eastern Time, Saturday, April 16, 2016 until Monday, April 18, 2016 at 6:00 a.m. Eastern Time. Applications cannot be submitted when Grants.gov is closed. The earliest anticipated start date for awards under this FFO is expected to be approximately September 2016.

  When developing your submission timeline, please keep in mind that: (1) all applicants are required to have a current registration in the System for Award Management (SMA.gov); (2) the free annual registration process in the electronic System for Award Management (SAM.gov) (*see* Section IV.3. and Section IV.7.a.(1).b. of this FFO) may take between three and five business days or as long as more than two weeks; (3) electronic applicants are required to have a current registration in Grants.gov; and (4) applicants using grants.gov 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. Please note a federal assistance award cannot be issued if the designated recipient's registration in the System for Awards Management (SAM.gov) is not current at the time of the award).

- **Application Submission Address:** Applications will only be accepted using Grants.gov.

- **Funding Opportunity Description:** NIST invites applications from eligible applicants to assess the economic impact of the Nation's Space-based positioning, navigation and timing (PNT). Specifically, the awardee, in collaboration with NIST, will identify key technologies developed by and transferred from federal laboratories that support GPS, estimate the qualitative and quantitative economic impact of these investments, and sponsor certain focused graduate and post-doctoral research. The applicant will conduct a ***retrospective analysis*** to estimate national benefits that have been realized by GPS and not project future benefits of GPS. The goals of this study are to: (1) identify and analyze the federal research and technology transfer activities and outputs that significantly impacted research, development, adoption and deployment of space-based GPS and the associated technology infrastructure related to applications with critical need for precision timing; (2) conduct a detailed analysis of the impacts of the use of GPS and precise time measurements across an array of applications, industries and throughout supply chains; (3) conduct a qualitative assessment of these impacts of GPS, precision timing and the associated technology infrastructure; (4) conduct a quantitative empirical assessment of the national economic impact of GPS, precision timing and the associated technology infrastructure; (5) draw upon its qualitative and quantitative analyses of federal R&D and technology transfer activities to identify lessons relevant to future GPS and timing investments; and (6) sponsor graduate and post-doctoral research thereby contributing to the development of the next generation of researchers focused on science, R&D and technology transfer impact analysis.

- **Anticipated Amounts:** NIST anticipates funding one multi-year project with a budget and performance period of up to two (2) years for up to approximately $400,000, subject to the availability of funds. Initial funding that may be obligated under this announcement is expected to be approximately $200,000 for the first year. The project may be continued for up to an additional year at a level of up to approximately $200,000, subject to the multi-year funding policy described in Section II.2. of this FFO.

- **Funding Instrument:** Cooperative Agreement

- **Who is Eligible:** Eligibility for this program is open to accredited institutions of higher education and non-profit organizations. While an eligible applicant must be incorporated in the United States, the applicant may have a parent organization outside the United States.

- **Cost Sharing Requirements:** This Program does not require cost sharing.

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FULL ANNOUNCEMENT TEXT

I. Program Description

The statutory authority for the Economic Impact of the Nation's Precision Timing Infrastructure: The Global Positioning System is 15 U.S.C. § 272(b) and (c).

1. **Overview.** NIST invites applications from eligible applicants to assess the economic impact of the Nation's space-based positioning, navigation and timing (PNT) technology infrastructure. The Federal Government spends more than $130 billion on research and development (R&D) each year, much of this performed through investments in Federal laboratories. This investment supports fundamental research that expands the frontiers of human knowledge, and yields extraordinary long-term economic impact through the creation of new knowledge and ultimately new industries – often in unexpected ways. The Global Positioning System (GPS) is one of the most widely recognized fruits of this federal technology transfer or "Lab to Market" process.

   NIST has a leadership role within a large group of public and private stakeholders and aids this group in establishing goals, measuring performance, streamlining administrative processes and facilitating partnerships that encourage commercialization of federally funded research and development. As part of the Administration's Lab-to-Market initiative, NIST received new funds, in part, to evaluate the impact of federal technology transfer programs and conduct economic studies that estimate the importance of federal technologies and supporting technical infrastructure.

   GPS is both a key result of federal investments in the precise measurement of time and a key element of the Nation's precision timing infrastructure. Federal investments in the precise measurement of time played a critical role in the development of GPS. GPS determines location by comparing the time signal embedded in radio transmissions received from satellites. Increased precision in the

measurement of time translates directly to precise measurement of location. Atomic clocks developed first by NIST allow satellites to precisely measure time. Currently, GPS also serves a mechanism for transmitting the precise time and synchronization information that is needed by a number of critical industries such as finance, modern telecommunications and electrical distribution. This precision timing infrastructure produces broad economic impacts. Although NIST plays a critical role in supporting advanced timing infrastructure, national-level guidance for GPS is provided by nearly all federal departments as well as vital non-government GPS experts to ensure that the system addresses national priorities. The goal of the analysis that is sought by this announcement is to identify key technologies developed by and transferred from federal laboratories that support GPS and estimate the economic impact of those investments.

This will be a ***retrospective study*** that will be very broad in terms of required disciplines and experience, which include, but are not limited to, 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 impacts.

As a ***retrospective analysis***, the aim of the analysis is to estimate national benefits that have been realized and not project future benefits of GPS. The goals of this study are to: (1) identify and analyze the federal research and technology transfer activities and outputs that significantly impacted research, development, adoption and deployment of space-based GPS and the associated technology infrastructure related to applications with critical need for precision timing; (2) conduct a detailed analysis of the impacts of the use of GPS and precise time measurements across an array of applications, industries and throughout supply chains; (3) conduct a qualitative assessment of these impacts of GPS, precision timing and the associated technology infrastructure; (4) conduct a quantitative empirical assessment of the national economic impact of GPS, precision timing and the associated technology infrastructure; (5) draw upon its qualitative and quantitative analyses of federal R&D and technology transfer activities to identify lessons relevant to future GPS and timing investments; and (6) sponsor graduate and post-doctoral research thereby contributing to the development of the next generation of researchers focused on science, R&D and technology transfer impact analysis. See Section I.3. of this FFO below for information on what the awardee will be required to do to meet these goals.

2. Background Information. Background information on GPS and relevant topical areas in the context of this FFO is provided below.

a. GPS. The deployment of the Nation's space-based PNT system or GPS and the subsequent growth in novel applications and uses of PNT systems have had tremendous economic impact. GPS offers a unique opportunity to document and understand how public investment in R&D in general and NIST investments in

measurement science and technology infrastructure in particular have translated into significant economic benefit. This translation from federally funded research to economic benefit depends critically on explicit and implicit technology transfer activities undertaken by federal laboratories. The history of GPS demonstrates how NIST's long-term investment in basic measurement science research has led to – and continues to lead to - NIST scientists' invention of disruptive new technologies and technology platforms, as well as innovation throughout the private sector. NIST efforts to transfer these technologies and knowledge to partners in industry, research laboratories, and Federal agencies, along with the provision of unique precision time-related measurements and services (infratechnologies) enables and supports a national / international timing infrastructure with broad impacts. Subsequent invention – based on precision timing inventions and infrastructure impacts wide areas of economic activity extending far beyond the narrow area of precision timing devices.

Recent research has highlighted that GPS demonstrates a very clear, concise narrative of economic and social gain from federally funded research. Space-based PNT systems make a large contribution to the economy and society and will have even greater benefits in the future. Defining and quantifying this contribution will add to the understanding of PNT-related applications, constituents and markets and be valuable for undertaking effective public and private planning and investment. Developing a greater understanding of applications and benefits has been made more essential by wide-ranging technological advances, rapid development of markets and growth of customer acceptance. GPS offers a unique opportunity to understand, how and the extent to which cutting edge investments in measurement science research coupled with other public and private investments in science, technology, development and deployment to deliver large national economic benefits.

b. NIST Research and Technology Development. Cutting edge research that pushes the frontiers of precision measurement research is at the core of the NIST mission. As a result of long-term NIST investment in research on precision timing, NIST scientists invent disruptive new technologies. The impact of these technologies extends far beyond timing. NIST invented the atomic clock in 1949, and subsequently engaged in 65 years of long-term research dedicated to continually improving atomic clocks. While in 1949 there was not a compelling need for dramatically better timing, nor an immediate obvious application for atomic clocks, their impacts have been tremendous. NIST inventors of the atomic clock likely never imagined a network of satellites containing atomic-clocks orbiting the earth and providing ubiquitous positioning and navigation information. However, GPS, as well as modern telecommunications, IT networks, and many other technologies used in everyday life, could not exist without atomic clocks.

Over the past 65 years, the pursuit of increasingly precise time measurements has led to the invention of technologies such as laser cooling, laser frequency

combs, and chip scale atomic clocks. These technologies have had broad impacts on science and technology in general, opening entire new areas of research such as investigations into ultracold matter (Bose Einstein condensate and related technologies) with enormous impacts on metrology and research. Laser frequency combs have opened an entire new range of precision measurements across a broad range of fields, and are already being used for improved communications, medical diagnostics, remote sensing of greenhouse gases, detection of threats (explosives, biohazards, etc.) – even detection of exoplanets. The range and number of applications are growing every day. The invention of chip-scale atomic clocks inspired the invention of similar technologies for precision measurement of magnetic fields, motion, acceleration, rotation, and other quantities, and the chip-scale magnetometer (another NIST invention) is now poised to replace costly MRI machines.

c. Underinvestment. Critical investment in research and technology Infrastructure is necessary to overcome barriers to private investment. Even with the demonstrated impacts noted above, significant research has documented the systematic underinvestment of funds in research, development and the technical infrastructure that support the development and deployment of cutting edge technologies such as GPS. This underinvestment is caused by a complex web of economic problems that systematically decrease private sector returns and diminish private incentives to invest in the technical infrastructure. These characteristics limit the ability of private entities to profit from the provision of such infrastructure.

d. Technology Infrastructure is the broad base of quasi-public technologies (technologies with varying degrees of public good[1] content) and technical knowledge that supports firms', universities', and laboratories' research, production, distribution and marketing of novel and improved products, processes, and services (e.g., higher quality, more effective, more efficient, more productive). Technology infrastructure, such as a reliable system of weights and measures, is in essence equally valuable to each and every stakeholder (non-rival) and must be available to all stakeholders (non-excludable) to realize its full economic benefit. By way of illustration, in contrast to an actual gallon of gasoline, which is only of use to the individual that uses that gallon in their personal car, a reliable measurement system for gallons of gasoline is valuable to ALL gasoline buyers and sellers (non-rival). Similarly, absent a common system used by all (non-excludable), a proliferation of idiosyncratic measurement approaches will diminish or even completely undermine the value of measurement as buyers and sellers each perform separate measurements and engage in potentially costly disputes to resolve differences.

[1] Public goods are non-rival and non-excludable as explained below. Quasi-public goods may be partially but not perfectly non-rival and/or non-excludable.

Technology infrastructure is composed of two elements: infratechnologies and technology platforms.[2] For the purposes of this FFO, these terms are defined as follows:

- **Infratechnologies** are a varied set of "technical tools" that include measurement and test methods, artifacts such as standard reference materials that allow these methods to be used efficiently, scientific and engineering databases, process models, and the technical basis for both physical and functional interfaces between components of systems technologies such as factory automation and communications. As Tassey writes "collectively [infratechnologies] constitute a diverse technical infrastructure, various types of which are applied at each stage of economic activity."[3] Infratechnologies affect the development of technology platforms and proprietary technologies. They also support efficient R&D, production, and market transactions.

- **Technology platforms** are precompetitive proofs-of-concept that demonstrate the potential commercial viability of a new or improved product, process, or service. Technology platforms will often be foundational to multiple products and processes, generally from multiple firms.

Firms and other stakeholders employ these technical tools – infratechnologies – to increase the efficiency of their R&D efforts as they develop and deploy proprietary technologies that build off of technology platforms. Firms and their customers further rely upon a perhaps distinct set of infratechnologies that ensure the quality and reliability of innovative products and process lowering the barriers to adoption and deployment.

e. Stakeholders and Potential Economic Impacts. Space-based PNT systems, GPS, have produced substantial economic, safety and environmental impact on broad and diverse sectors of the economy. Most consumers are extremely familiar with devices that receive and use location–based information, for example, devices embedded within vehicles, smart-phones and associated software applications. They are, however, less familiar with the full scope of the role played by GPS and precision timing in enabling modern telecommunications, electric power distribution and financial services, and there is most likely even less pubic appreciation for the economic impacts of the growing number and sophistication of applications that are being used throughout the transportation, construction, financial, agricultural, and other sectors, doing everything from guiding machinery and equipment to controlling the precision application of

[2] For a more thorough explanation of technology infrastructure and its components, please see "The Economics of R&D Policy" by Gregory Tassey, published in 1997 by the Greenwood Publishing Group, and "The Technology Imperative" by Gregory Tassey, published in 2007 by Edward Elgar Publishing.[3] Tassey, G. "Underinvestment in Public Good Technologies," *Journal of Technology Transfer*, 30 1-2, 89-113, 2005.

[3] Tassey, G. "Underinvestment in Public Good Technologies," *Journal of Technology Transfer*, 30 1-2, 89-113, 2005.

irrigation, fertilizers and pesticides. GPS systems produce significant improvements in productivity and environment improvements. For example, by improving the efficiency of industrial and commercial processes, precision applications can save on fuel and reduce air pollution. GPS time is used to synchronize computer systems and broadcasts. Governments take advantage of GPS technology for forest management, floodplain management and monitoring compliance with environmental regulations. The improvements in productivity, new products and product enhancements that result direct from the use of GPS not only benefit those industry sectors, they stimulate economy-wide growth. The table below demonstrates the size of the GPS stakeholder community and the pervasive use and impact of GPS throughout the economy.

Sector/Industry	**Potential Impact of GPS Positioning, Navigation, and Timing**
Transport (automotive, rail, air)	Reduced congestion, fossil fuel usage and pollution, increased productivity and efficiency in transportation, shipping and logistics
Surveying and Mapping	Increased productivity, reduced labor and time usage, reduction in disputes and transactions costs.
Construction	Increased productivity for certain activities (e.g., earth moving)
Agriculture	Reduced usage of inputs (e.g., irrigation, fertilizers, pesticides, and fuel), increased crop yields, environmental benefits.
Mining	Productivity improvements
Energy	Reduced incidence and severity of power outages, reduced transmission losses, reduced transactions costs
Telecommunications	Novel communications technologies, more efficient spectrum usage, increased data throughput
Finance	Increased productivity and reduced transactions costs.
Consumer Products	Novel consumer applications
Software and Publishing	Novel software and media
Scientific Research	Increased R&D efficiency, novel discoveries

3. **Identification and Impact Assessment of Space-based PNT and associated precision timing technology infrastructure**. The awardee, in collaboration with NIST, will analyze the economic impact of space-based PNT systems and the associated infratechnologies and technology platforms as defined above (measurement and test methods, science and engineering data, modeling and simulation, functional interfaces, performance metrics, etc.) related to the Nation's precision timing infrastructure. The awardee will characterize the development of GPS, emphasizing the roles and current status of technical infrastructure (technology platforms, and measurement and other infratechnologies and associated standards), characterize the supply chain for PNT devices and services, and relate this information to the quantitative and qualitative gains resulting from GPS and precision timing technical infrastructure.

In addition, the awardee will conduct a rigorous collection and analysis of original stakeholder data on the economic and societal impacts of GPS, precision timing infrastructure and the associated technical infrastructure. The awardee will use these data to develop metrics and an analytical methodology and then use this methodology to conduct intensive industry surveys. The awardee will develop a methodology for empirically estimating the quantitative value of GPS and the associated technology infrastructure and use this methodology to determine qualitatively and quantitatively the economic and societal impacts of GPS, precision timing infrastructure and the associated technical infrastructure. Additionally, the awardee will draw upon its qualitative and quantitative analyses of federal R&D and technology transfer activities to identify lessons relevant to future GPS and timing investments. The qualitative and quantitative findings will be disseminated in the form of publications.

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. This includes NIST collaboration with a recipient on the scope of work. Additional forms of substantial involvement that may arise are described in Chapter 5.C of the Department of Commerce Grants and Cooperative Agreements Manual, which is available at http://go.usa.gov/SNJd. Please note the Department of Commerce Grants and Cooperative Agreements Manual is expected to be updated after publication of this funding announcement and before awards are made under this FFO. Refer to Section VII. of this FFO, Federal Awarding Agency Contacts, Grant Rules and Regulations, if you seek the information at this link and it is no longer working or you need more information.

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.

3. **Funding Availability.** NIST anticipates funding one multi-year project with a budget and performance period of up to two (2) years for up to approximately $400,000, subject to the availability of funds. Initial funding that may be obligated under this announcement is expected to be approximately $200,000 for the first year. The project may be continued for up to an additional year at a level of up to approximately $200,000, subject to the multi-year funding policy described in Section II.2. of this FFO.

III. Eligibility Information

1. **Eligible Applicants.** Eligibility for this program is open to accredited institutions of higher education and non-profit organizations. While an eligible applicant must be incorporated in the United States, the applicant may have a parent organization outside the United States.

2. **Cost Sharing or Matching.** This program does not require cost sharing.

IV. Application and Submission Information

1. **Address to Request Application Package.** The standard application package, consisting of the standard forms, i.e., SF-424, SF-424A, SF-424B, SF-LLL, and the CD-511, is available at www.grants.gov. The standard application package may also be requested by contacting the NIST personnel listed below:

   Gary Anderson, Technology Partnerships Office, National Institute of Standards and Technology, 100 Bureau Dr., Mail Stop 2201, Gaithersburg, MD, 20899 (Phone: (301) 975-5238; e-mail: gary.anderson@nist.gov).

2. **Content and Format of Application Submission**

a. Required Forms and Documents

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

SF-424, Item 12, should list the FFO number 2016-NIST-TPO-01.

SF-424, Item 18, should list the total budget information for the duration of the project.

For SF-424, Item 21, the list of certifications and assurances is contained in the SF-424B.

(2) SF-424A, Budget Information – Non-Construction Programs. The budget should reflect anticipated expenses for the project, considering all potential cost increases, including cost of living adjustments.

The Grant Program Function or Activity on Line 1 under Column (a) should be entered as Science, Technology, Business and/or Education Outreach. The Catalog of Federal Domestic Assistance Number on Line 1 under Column (b) should be entered as 11.620.

(3) SF-424B, Assurances – Non-Construction Programs

(4) CD-511, Certification Regarding Lobbying. Enter "2016-NIST-TPO-01" in the Award Number field. Enter the title of the application used in field 15 of the SF-424, or an abbreviation of that title, in the Project Name field.

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

(6) Technical Proposal. The Technical Proposal is a word-processed document of no more than twenty-five (25) pages responsive to the program description (*see* Section I. of this FFO) and the evaluation criteria (*see* Section V.1. of this FFO). The technical proposal 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 FFO). 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 (*see* Section I. of this FFO) and the methodology that will be used to:

- analyze the federal research and technology transfer activities and outputs that significantly impacted research, development, adoption and deployment of space-based GPS and the associated technology infrastructure related to applications with critical need for precision timing;
- conduct a detailed analysis of the impacts of the use of GPS and precise time measurements across an array of applications, industries and throughout supply chains;
- conduct a qualitative assessment of these impacts of GPS, precision timing and the associated technology infrastructure;
- conduct a quantitative empirical assessment of the national economic benefit of GPS, precision timing and the associated technology infrastructure;
- draw upon its qualitative and quantitative analyses of federal R&D and technology transfer activities to identify lessons relevant to future GPS and timing investments;
- sponsor graduate and post-doctoral research focused on science, R&D and technology transfer impact analysis.

This section should address the *Project Approach* evaluation criterion (*see* Section V.1.a. of this FFO).

(c) Statement of Work. A complete statement of work covering all aspects of the project describing a schedule of measurable events and milestones as well as measurable performance objectives that can be used to determine the success of the project. In particular, the following should be described:

- the methodologies that will be used to manage the project;
- the milestones for project tasks and how the milestones will permit the applicant to assess incremental progress of the project and fit into the overall schedule for the project;
- the tasks and activities to implement the proposed project objectives; and
- the key project risks and the risk response strategies to address these risks.

This section should address the *Statement of Work* evaluation criterion (*see* Section V.1.b. of this FFO).

(d) Dissemination of Results Plan. The description of how data and results from the project will be disseminated in the scientific literature and on publically available websites. This section should specifically explain how the applicant plans to distribute materials from the project, including results and interpretation of the project results, in the form of publications in the scientific literature and on publically available websites.

This section should address the *Dissemination of Results Plan* evaluation criterion (*see* Section V.1.c. of this FFO).

(e) 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. In particular, the following should be described, as applicable, for key personnel:

- any past experience with evaluating the economic impact of the technology infrastructure;
- 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 applicant should include a plan showing how the applicant will obtain such expertise to meet the objectives of this FFO); and

- any previously demonstrated ability to achieve positive outcomes in endeavors with program objectives that are similar to those of this FFO as described in Section I. of this FFO.

This section should address the *Qualifications* evaluation criterion (*see* Section V.1.d. of this FFO).

(f) Resumes of key personnel may be included, but are not required. Resumes are not included in the page count of the Technical Proposal. If resumes are included, resumes are to 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.

(7) Budget Narrative. There is no set format for the Budget Narrative; however, it should provide a detailed breakdown of each of the object class categories as reflected on the SF-424A.

(8) 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 the Department of Commerce Financial Assistance Standard Terms and Conditions, December 26, 2014, available at http://go.usa.gov/hKbj.

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.

(9) Data Management Plan. In accordance with the Office of Science and Technology Memorandum for the Heads of Executive Departments and Agencies of February 22, 2013[4], *Increasing Access to the Results of Federally Funded Scientific Research*, and as implemented through NIST Policy 5700.00[5], *Managing Public Access to Results of Federally Funded Research,* and NIST Order 5701.00[6], *Managing Public Access to Results of Federally Funded Research*," applicants should include a Data Management Plan (DMP).

[4] https://www.whitehouse.gov/sites/default/files/microsites/ostp/ostp_public_access_memo_2013.pdf
[5] http://www.nist.gov/open/upload/Final-P-5700.pdf
[6] http://www.nist.gov/open/upload/Final-O-5701_0.pdf

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[7] or the National Institutes of Health[8]). Some organizations' templates are available on the Internet[9].

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

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

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. **Items IV.2.a.(6) through IV.2.a.(9) must be completed and attached by clicking on "Add Attachments" found in item 15 of the SF-424, Application for Federal Assistance. This will create a zip file that allows for transmittal of the documents electronically via Grants.gov.**

Applicants should carefully follow specific Grants.gov instructions at www.grants.gov 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 using Grants.gov will receive email 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.

[7] http://www.nsf.gov/bfa/dias/policy/dmp.jsp
[8] http://grants.nih.gov/grants/policy/data_sharing/data_sharing_guidance.htm
[9] https://www.cic.net/projects/technology/shared-storage-services/data-management-plans

The Grants.gov Online Users Guide available at the Grants.gov web site (http://go.usa.gov/cjaEh) provides vital information on checking the status of applications.

See especially the "Check My Application Status" option, found by clicking first on Applicants, and then by clicking on Applicant Actions.

Applicants can check if the application's attachments were present by clicking on the Download Submitted Applications option found under the "Check My Application Status" option.

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 move fully through the Grants.gov system to NIST.

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

b. Application Format

(1) Mail, e-mail 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 landscape orientation.

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

(4) Line spacing. Applicants may use single spacing or double spacing.

(5) Margins. One (1) inch top, bottom, left, and right.

(6) Page layout. Portrait orientation except for figures, graphs, images, and pictures. Paragraphs are to be clearly separated from each other by double spacing, paragraph formatting or equivalent.

(7) Page limit. The Technical Proposal is limited to twenty-five (25) pages.

(a) Page limit includes: Table of contents (if included), Technical Proposal with all suggested information, including figures, graphs, tables, images, and pictures.

(b) Page limit excludes: SF-424, Application for Federal Assistance; SF-424A, Budget Information – Non-Construction Programs; SF-424B, Assurances – Non-Construction Programs; CD-511, Certification Regarding Lobbying; SF-LLL, Disclosure of Lobbying Activities; Resumes

(if included); Budget Narrative; Indirect Cost Rate Agreement; and the Data Management Plan.

(8) Page numbering. Number pages sequentially.

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

(10) Application Language. English.

c. 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.

d. Pre-Applications. NIST is not accepting pre-applications or white papers under this FFO.

e. 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 (as the case may be) 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 FFO, 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 by NIST electronically through Grants.gov no later than 11:59 p.m. Eastern Time, Friday, May 6, 2016. Applications received after this deadline will not be reviewed or considered. 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 these times: from 12:01 a.m. Eastern Time, Saturday, March 19, 2016 until Monday, March 21, 2016 at 6:00 a.m. Eastern Time, and from 12:01 a.m. Eastern Time, Saturday, April 16, 2016 until Monday, April 18, 2016 at 6:00 a.m. Eastern Time.

Applications cannot be submitted when Grants.gov is closed. NIST will consider the date and time stamped on the validation generated by www.grants.gov as the official submission time.

NIST strongly recommends that applicants do not wait until the last minute to submit an application. NIST will not make allowance for any late submissions. To avoid any potential processing backlogs due to last minute Grants.gov registrations, applicants are highly encouraged to begin their Grants.gov registration process early.

When developing your submission timeline, please keep in mind that (1) all applicants are required to have a current registration in the System for Award Management (SAM.gov); (2) the free annual registration process in the electronic System for Award Management (SAM.gov) (*see* Section IV.3. and Section IV.7.a.(1).b. of this FFO) may take between three and five business days, or as long as more than two weeks; (3) electronic applicants are required to have a current registration in Grants.gov; and (4) applicants will receive a series of e-mail messages from Grants.gov over a period of up to two business days before learning whether a Federal agency's electronic system has received its application. 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.

Applicants will find instructions on registering with SAM.gov as part of the Grants.gov process at: http://www.grants.gov/web/grants/applicants/organization-registration.html.

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

6. **Funding Restrictions.** Profit or fee is not an allowable cost.

7. **Other Submission Requirements**

a. **Applications must be submitted electronically through www.grants.gov.** NIST will not accept applications submitted by mail, facsimile, or e-mail.

(1) Electronic applications must be submitted via Grants.gov at www.grants.gov under announcement 2016-NIST-TPO-01.

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 2016-NIST-

TPO-01 announcement, contact Christopher Hunton by phone at 301-975-5718 or by e-mail at grants@nist.gov.

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. If all goes well, the registration process takes three (3) to five (5) business days. If problems are encountered, the registration process can take up to two (2) 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. *See also* Section IV.3. of this FFO. 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, with the exception of Federal holidays. Help Desk service will resume at 7:00 a.m. Eastern Time the day after Federal holidays. For assistance using Grants.gov, you may also contact support@grants.gov.

c. To find instructions on submitting an application on Grants.gov, Applicants should refer to the "Applicants" tab in the banner just below the top of the www.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. Closely following the detailed information in these subcategories will increase the likelihood of acceptance of the application by the Federal agency's electronic system.

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

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 know whether the application was rejected with errors and the reasons why, 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 your application before the deadline. If the applicant does not correct the errors, the application will not be forwarded to NIST by Grants.gov.

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 on the deadline date.

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

b. Amendments. Any amendments to this FFO will be announced through Grants.gov. Applicants may sign up for Grants.gov FFO amendments or may request copies from Gary Anderson by telephone at (301) 975-5238, or by e-mail: gary.anderson@nist.gov.

V. Application Review Information

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

a. Project Approach. (0 – 60 points, sub-criteria below receive equal weight) Reviewers will evaluate the extent to which the applicant's proposed approach clearly addresses the program goals (*see* Section I. of this FFO) and the extent to which the proposed methodologies will efficiently and effectively do the following:

- Identify and analyze the federal research and technology transfer activities and outputs that significantly impacted research, development, adoption and deployment of space-based GPS and the associated technology infrastructure related to applications with critical need for precision timing;
- conduct a detailed analysis of the impacts of the use of GPS and precise time measurements across an array of applications, industries and throughout supply chains;
- conduct a qualitative assessment of these impacts of GPS, precision timing and the associated technology infrastructure;
- conduct a quantitative empirical assessment of the national economic benefit of GPS, precision timing and the associated technology

infrastructure;
- draw upon its qualitative and quantitative analyses of federal R&D and technology transfer activities to identify lessons relevant to future GPS and timing investments; and
- sponsor graduate and post-doctoral research thereby contributing to the development of the next generation of researchers that focus on science, R&D and technology transfer impact analysis.

b. Statement of Work. (0 – 20 points, sub-criteria below receive equal weight) Reviewers will assess the extent to which the applicant's schedule of measurable events and milestones as well as the measurable performance objectives contribute to the evaluation of the success of the project. In particular, reviewers will evaluate the extent to which the following aspects of the statement of work are reasonable and likely to contribute to the overall management of the project by the applicant:
- the methodologies used to manage the project;
- the milestones and how well the milestones will permit the applicant to assess incremental progress of the project and fit into the overall schedule for the project;
- the tasks and activities implementing the proposed project objectives; and
- the key project risks and how well the risk response strategies will allow the applicant to address these risks.

c. Dissemination of Results Plan. (0 – 10 points) Reviewers will evaluate the extent to which the applicant's approach to disseminating project data and results is likely to result in their publication in the appropriate scientific literature and on publically available websites.

d. Qualifications. (0 - 10 points) Reviewers will evaluate the extent to which the qualifications of the key personnel, the time commitments of the key personnel, and the project staff's qualifications will enable them to conduct the project work. In particular, the following aspects for key personnel will be assessed and evaluated for their adequacy and the extent to which they are likely to contribute to success of the project:
- past experience with evaluating the economic impact of the technology infrastructure;
- 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 feasibility and reasonableness of the applicant's plan to obtain such expertise to meet the objectives of this FFO); and
- previously demonstrated ability to achieve positive outcomes in endeavors

with program objectives that are similar to those of this FFO as described in Section I. of this FFO.

2. **Selection Factors.** The Selecting Official, who is the Director of the Technology Partnerships Office, or designee, will make final application selections. The Selecting official shall select applications for awards based on the rank order of the applications (*see* Section V.3. of this FFO), may select an application out of rank, and may select no application based on one or more of the following selection factors:

   a. The results of the reviewers' evaluations.

   b. The objectives as set forth in the Funding Opportunity Description (*see* Section I. of this FFO).

   c. Whether the project duplicates other projects funded by NIST, DoC, or by other Federal agencies.

   d. The availability of Federal funds.

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, Federal agents and contractors, and/or by non-Federal personnel who have entered into nondisclosure agreements covering such information, when applicable.

a. Initial Administrative Review of Applications. An initial review of timely received applications will be conducted to determine eligibility, completeness, and responsiveness to this FFO and the scope of the stated program objectives. Applications determined to be ineligible, incomplete, and/or non-responsive 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 lack of which may easily be rectified or cured.

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:

At least three (3) objective reviewers knowledgeable about the scientific areas described in the application will conduct a technical review of each application, based on the evaluation criteria (*see* Section V.1. of this FFO). If non-Federal reviewers are used, the reviewers may discuss the applications with each other, but scores will be determined on an individual basis, not as a consensus. Based on the reviewers' scores, a rank order will be prepared and provided to the Selecting Official for further consideration. The Selecting Official will then recommend funding

recipients based upon the rank order and the selection factors (*see* Section V.2. of this FFO).

NIST reserves the right to negotiate the budget costs with the selected applicant. Negotiations may include requesting that the applicant remove certain costs. Additionally, NIST may request that the applicant 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 particular application. The final approval of selected applications and issuance of awards will be by the NIST Grants Officer. The award decisions of the 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, reports and finding from financial assistance audits, 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 $150,000), 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 option, 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 special conditions that correspond to the degree of risk posed by the applicant should be applied to an award.

4. Anticipated Announcement and Award Dates. The earliest anticipated start date for awards made under this FFO is expected to be September 2016.

5. Additional Information

a. Notification to Unsuccessful Applicants. Unsuccessful applicants will be notified in writing.

b. Retention of Unsuccessful Applications. An electronic copy of each non-selected application will be retained for up to three (3) years for record keeping purposes.

VI. Federal Award Administration Information

1. **Federal Award Notices.** Successful applicants will receive an award from the NIST Grants Officer. The award cover page, i.e., CD-450, Financial Assistance Award is available at http://go.usa.gov/SNMR.

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 the Financial Assistance Standard Terms and Conditions dated December 26, 2014, accessible at http://go.usa.gov/hKbj, to this award. Refer to Section VII. of this FFO, Federal Awarding Agency Contacts, Grant Rules and Regulations, if you seek the information at this link and it is no longer working or 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 FFO, Federal Awarding Agency Contacts, Grant Rules and Regulations, if you seek the information at this link and it is no longer working or you need more information.

d. **Funding Availability and Limitation of Liability.** Funding for the program listed in this FFO is contingent upon the availability of appropriations. In no event will NIST or the Department of Commerce be responsible for application preparation costs if this program fails to receive funding or is cancelled because of agency priorities. Publication of this FFO 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.** All applications should include a description of any work proposed to be performed by an entity other than the applicant, and the cost of such work should ordinarily be included in the budget.

   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 NIST Intellectual Property. If the applicant anticipates using any NIST-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 NIST 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 NIST-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 D.03 of the DoC Financial Assistance Terms and Conditions dated December 26, 2014, found at http://go.usa.gov/hKbj. Questions about these requirements may be directed to Chief Counsel for NIST, (301) 975-2803, nistcounsel@nist.gov.

Any use of NIST-owned intellectual property by an applicant is at the sole discretion of NIST 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 NIST employee arise in the course of an award made pursuant to this FFO, the United States government may retain its ownership rights in any such invention. Licensing or other disposition of NIST's rights in such inventions will be determined solely by NIST, and include the possibility of NIST putting the intellectual property into the public domain.

g. Research Activities Involving Human Subjects, Human Tissue, Data or Recordings Involving Human Subjects Including Software Testing. Any application that includes research activities involving human subjects, human tissue/cells, or data or recordings from or about human subjects, must satisfy the requirements of the Common Rule for the Protection of Human Subjects ("Common Rule"), codified for the Department of Commerce at 15 C.F.R. Part 27. Research activities involving human subjects who fall within one or more of the classes of vulnerable subjects found in 45 C.F.R. Part 46, Subparts B, C and D must satisfy the requirements of the applicable subpart(s). In addition, any such application that includes research activities on these subjects must be in compliance with all applicable statutory requirements imposed upon the Department of Health and Human Services (DHHS) and other Federal agencies, all regulations, policies and guidance adopted by DHHS, the Food and Drug Administration, and other Federal agencies on these topics, and all Executive Orders and Presidential statements of policy on applicable topics. (Regulatory Resources: http://www.hhs.gov/ohrp/humansubjects/index.html which includes links to FDA regulations, but may not include all applicable regulations and policies).

NIST uses the following Common Rule definitions for research and human subjects research:

Research: A systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge. Activities which meet this definition constitute research for purposes of this policy, whether or not they are conducted or supported under a program which is considered research for other purposes. For example, some demonstration and service programs may include research activity.

Human Subject: A living individual about whom an investigator (whether professional or student) conducting research obtains data through intervention or interaction with the individual or identifiable private information.

(1) *Intervention* includes both physical procedures by which data are gathered and manipulations of the subject or the subject's environment that are performed for research purposes.

(2) *Interaction* includes communication or interpersonal contact between investigator and subject.

(3) *Private information* includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, a medical record). Private information must be individually identifiable (i.e., the identity of the subject is or may readily be ascertained by the investigator associated with the information) in order for obtaining the information to constitute research involving human subjects.

See 15 C.F.R. § 27.102 Definitions.

1) **Requirement for Federalwide Assurance.** If the application is accepted for [or awarded] funding, organizations that have an IRB are required to follow the procedures of their organization for approval of exempt and non-exempt research activities that involve human subjects. Both domestic and foreign organizations performing non-exempt research activities involving human subjects will be required to have protocols approved by a cognizant, active IRB currently registered with the Office for Human Research Protections (OHRP) within the DHHS that is linked to the engaged organizations. All engaged organizations must possess a currently valid Federalwide Assurance (FWA) on file from OHRP. Information regarding how to apply for an FWA and register an IRB with OHRP can be found at http://www.hhs.gov/ohrp/assurances/index.html. NIST relies only on OHRP-issued FWAs and IRB Registrations for both domestic and

foreign organizations for NIST supported research involving human subjects. NIST will not issue its own FWAs or IRB Registrations for domestic or foreign organizations.

2) **Administrative Review.** NIST reserves the right to make an independent determination of whether an applicant's activities include research involving human subjects. NIST will conduct an independent administrative review of all applications accepted for funding that include research involving human subjects that were approved by a non-NIST Institutional Review Board (IRB). Research may not start until the NIST Human Subjects Protection Office (HSPO) issues institutional review approval for final action by the NIST Grants Officer. (15 C.F.R. § 27.112 Review by Institution.) If NIST determines that an application includes research activities which involve human subjects, the applicant will be required to provide additional information for review and approval. The documents required for funded proposals are listed in each section below. Most such documents will need to be produced during the proposal review process; however, the Grants Officer may allow final versions of certain required documents to be produced at an appropriate designated time post-award. If an award is issued, no research activities involving human subjects shall be initiated or costs incurred for those activities under the award until the NIST Grants Officer issues written approval. Retroactive approvals are not permitted.

3) **Required documents for proposal review. All applications involving human subject research must clearly indicate, by separable task, all research activities believed to be exempt or non-exempt research involving human subjects, the expected institution(s) where the research activities involving human subjects may be conducted, and the institution(s) expected to be engaged in the research activities.**

   a. **Not research determination.** If an activity/task involves human subjects as defined in the Common Rule, but the applicant participant(s) indicates to NIST that the activity/task is not research as defined in the Common Rule, the following information may be requested for that activity/task:

      (1) Justification, including the rationale for the determination and such additional documentation as may be deemed necessary by NIST to review and/or support a determination that the activity/task in the application is not research as defined in the Common Rule.
      (2) If the applicant participant(s) used a cognizant IRB that provided a determination that the activity/task is not research, a copy of that determination documentation must be provided to NIST. The applicant participant(s) is not required to establish a relationship with a cognizant IRB if they do not have one.

   NIST will review the information submitted and may coordinate further with the applicant before determining whether the activity/task will be defined as research

under the Common Rule in the applicable NIST financial assistance program or project.

b. **Exempt research determination with no IRB.** If the application appears to NIST to include exempt research activities, and the performer of the activity or the supplier and/or the receiver of the biological materials or data from human subjects **does not** have a cognizant IRB to provide an exemption determination, the following information may be requested during the review process so that NIST can evaluate whether an exemption under the Common Rule applies (see 15 C.F.R. § 27.101(b), (c) and (d)).

   (1) The name(s) of the institution(s) where the exempt research will be conducted.
   (2) The name(s) of the institution(s) providing the biological materials or data from human subjects will be provided.
   (3) A copy of the protocol for the research to be conducted; and/or the biological materials or data from human subjects to be collected/provided, not pre-existing samples (*i.e.,* will proposed research collect only information without personal identifiable information, will biological materials or data be de-identified and when and by whom was the de-identification performed, how were the materials or data originally collected).
   (4) For pre-existing biological materials or data from human subjects, provide copies of the consent forms used for collection and a description of how the materials or data were originally collected and stripped of personal identifiers. If copies of consent forms are not available, explain.
   (5) Any additional clarifying documentation that NIST may deem necessary in order to make a determination whether the activity/task or use of biological materials or data from human subjects is exempt under the Common Rule.

c. **Research review with an IRB.** If the application appears to NIST to include research activities (exempt or non-exempt) involving human subjects, and the proposed performer of the activity has a cognizant IRB registered with OHRP, and linked to their Federalwide Assurance, the following information may be requested during the review process:

   (1) The name(s) of the institution(s) where the research will be conducted;
   (2) The name(s) and institution(s) of the cognizant IRB(s), and the IRB registration number(s);
   (3) The FWA number of the applicant linked to the cognizant IRB(s);
   (4) The FWAs associated with all organizations engaged in the planned research activity/task, linked to the cognizant IRB;
   (5) If the IRB review(s) is pending, the estimated start date for research involving human subjects;

(6) The IRB approval date (if currently approved for exempt or non-exempt research);
(7) If any of the engaged organizations has applied for or will apply for an FWA or IRB registration, those details should be clearly provided for each engaged organization.

If the application includes research activities involving human subjects to be performed in the first year of an award, additional documentation may be requested by NIST during pre-award review for those performers, and may include the following for those research activities:

(1) A signed (by the study principal investigator) copy of each applicable final IRB-approved protocol;
(2) A signed and dated approval letter from the cognizant IRB(s) that includes the name of the institution housing each applicable IRB, provides the start and end dates for the approval of the research activities, and any IRB-required interim reporting or continuing review requirements;
(3) A copy of any IRB-required application information, such as documentation of approval of special clearances (*i.e.,* biohazard, HIPAA, etc.) conflict-of-interest letters, or special training requirements;
(4) A brief description of what portions of the IRB submitted protocol are specifically included in the application submitted to NIST, if the protocol includes tasks not included in the application, or if the protocol is supported by multiple funding sources. For protocols with multiple funding sources, NIST will not approve the study without a non-duplication-of-funding letter indicating that no other federal funds will be used to support the tasks proposed under the proposed research or ongoing project;
(5) If a new protocol will only be submitted to an IRB if an award from NIST is issued, a draft of the proposed protocol;
(6) Any additional clarifying documentation that NIST may request during the review process to perform the NIST administrative review of research involving human subjects. (*See* 15 C.F.R. § 27.112 Review by Institution.)

This clause reflects the existing NIST policy and requirements for Research Involving Human Subjects. Should the policy be revised prior to award, a clause reflecting the policy current at time of award may be incorporated into the award.

If the policy is revised after award, a clause reflecting the updated policy may be incorporated into the award.

For more information regarding research projects involving human subjects, contact Anne Andrews, Director, NIST Human Subjects Protection Office (e-mail: anne.andrews@nist.gov; phone: (301) 975-5445).

h. Research Activities Involving Live Vertebrate Animals. Any application that includes research activities involving live vertebrate animals, that are being cared

for, euthanized, or used by participants in the application to accomplish research goals, teaching, or testing, must meet the requirements of the Animal Welfare Act (AWA) (7 U.S.C. § 2131 et seq.), and the AWA final rules (9 C.F.R. Parts 1, 2, and 3), and if appropriate, the Good Laboratory Practice for Non-clinical Laboratory Studies (21 C.F.R. Part 58). In addition, such applications should be in compliance with the *"U.S. Government Principles for Utilization and Care of Vertebrate Animals Used in Testing, Research, and Training."* The Principles and guidance on these Principles are available in the National Research Council's "Guide for the Care and Use of Laboratory Animals," which can be obtained from National Academy Press, 500 5th Street, N.W., Department 285, Washington, DC 20055, or as a free PDF online at http://www.nap.edu/catalog/12910/guide-for-the-care-and-use-of-laboratory-animals-eighth.

The following requirements do not apply to proposed research using preexisting images of animals or to research plans that do not include live animals. These regulations also do not apply to obtaining stock items from animal material suppliers (*e.g.,* tissue banks), such as cell lines and tissue samples, or from commercial food processors, where the vertebrate animal was euthanized for food purposes and not for the purpose of sample collection.

Custom Collections Harvested from Live Vertebrate Animals: NIST requires documentation for obtaining custom samples from live vertebrate animals from animal material suppliers and other organizations (*i.e.,* universities, companies, and government laboratories, etc.). Custom samples includes samples from animal material suppliers, such as when a catalog item indicates that the researcher is to specify the characteristics of the live vertebrate animal to be used, or how a sample is to be collected from the live vertebrate animal.

Field Studies of Animals: Some field studies of animals may be exempt under the Animal Welfare Act from full review and approval by an animal care and use committee, as determined by each institution. Field study is defined as "*…a study conducted on free-living wild animals in their natural habitat."* However, this term excludes any study that involves an invasive procedure or that harms or materially alters the behavior of an animal under study. Field studies, with or without invasive procedures, may also require obtaining appropriate federal or local government permits (*e.g.,* marine mammals, endangered species etc.). If the applicant's institution requires review and approval by an animal care and use committee, NIST will require that documentation to be provided as described below.

1) **Requirement for Assurance.** An applicable assurance for the care and use of the live vertebrate animal(s) to be used in the proposed research is required. NIST accepts three types of assurances, as may be applicable. NIST may request documentation to confirm an assurance, if adequate confirmation is not available through an assuring organization's website.

The cognizant Institutional Animal Care and Use Committee (IACUC) where the research activity is located may hold one or more applicable assurance, including:

- Animal Welfare Assurance from the Office of Laboratory Animal Welfare (OLAW) indicated by the OLAW assurance number, *i.e.,* A-1234;
- USDA Animal Welfare Act certification indicated by the certification number, *i.e.,* 12-R-3456;
- Association for the Assessment and Accreditation of Laboratory Animal Care (AAALAC) indicated by providing the organization name accredited by AAALAC as listed in the AAALAC Directory of Accredited Organizations.

2) Administrative Review. NIST reserves the right to make an independent determination of whether an applicant's research activities involve live vertebrate animals or custom samples from, or field studies with live vertebrate animals. If NIST determines that the application includes research activities, field studies, or custom samples involving live vertebrate animals, the applicant will be required to provide additional information for review and approval. The documents required for funded proposals are listed in each section below. Some may be requested for a pre-review during the proposal review process; however, the Grants Officer may allow final versions of certain required documents to be produced at an appropriate designated time post-award. If an award is issued, no research activities involving live vertebrate animals subjects shall be initiated or costs incurred for those activities under the award until the NIST Grants Officer issues written approval.

3) Required documents for proposal review. ***The applicant should clearly indicate in the application, by separable task, all research activities believed to include research involving live vertebrate animals and the institution(s) where the research activities involving live vertebrate animals may be conducted.***

Documentation of Research Review by an IACUC: If the applicant's application appears to include research activities, field studies, or custom sample collections involving live vertebrate animals the following information regarding review by an applicable IACUC may be requested during the application review process:

1. The name(s) of the institution(s) where the research involving live vertebrate animals will be conducted and/or custom samples collected;
2. The assurance type and number, as applicable, for the cognizant Institutional Animal Care and Use Committee (IACUC) where the research activity is located. [For example: Animal Welfare Assurance from the Office of Laboratory Animal Welfare (OLAW) should be indicated by the OLAW assurance number, i.e. A-1234; an USDA Animal Welfare Act certification should be indicated by the certification number i.e. 12-R-3456; and an

Association for the Assessment and Accreditation of Laboratory Animal Care (AAALAC) should be indicated by AAALAC.]

3. The IACUC approval date for the Animal Study Protocol (ASP) (if currently approved);
4. If the review by the cognizant IACUC is pending, the estimated- start date for research involving vertebrate animals;
5. If any assurances or IACUCs need to be obtained or established, that should be clearly stated.
6. If any special permits are required for field studies, those details should be clearly provided for each instance, or indicated as pending.

If the application includes research activities involving vertebrate animals to be performed in the first year of an award, additional documentation may be requested by NIST during pre-award review for those performers, and may include the following for those research activities, which may also include field studies, custom sample collections involving live vertebrate animals:

1. A signed (by the Principal Investigator) copy of the IACUC approved ASP;
2. Documentation of the IACUC approval indicating the approval and expiration dates of the ASP; and
3. If applicable, a non-duplication-of-funding letter if the ASP is funded from several sources.
4. If a new ASP will only be submitted to an IACUC if an award from NIST is issued, a draft of the proposed ASP may be requested.
5. Any additional clarifying documentation that NIST may request during review of applications to perform the NIST administrative review of research involving live vertebrate animals.

This clause reflects the existing NIST policy for Research Involving Live Vertebrate Animals. Should the policy be revised prior to award, a clause reflecting the policy current at time of award may be incorporated into the award.

If the policy is revised after award, a clause reflecting the updated policy may be incorporated into the award.

For more information regarding research projects involving live vertebrate animals, contact Linda Beth Schilling, Senior Analyst (e-mail: linda.schilling@nist.gov; phone: 301-975-2887).

i. Collaborations Making Use of Federal Facilities. All applications should include a description of any work proposed to be performed using Federal facilities.

If an applicant proposes use of NIST facilities, the statement of work should include a statement of this intention and a description of the facilities. Any use of NIST facilities 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

availability of the facilities and approval of the proposed usage. Any unapproved facility use will be stricken from the application prior to the merit review. Examples of some facilities that may be available for collaborations are listed on the following NIST Web site: http://www.nist.gov/user-facilities.cfm.

3. Reporting

a. Reporting Requirements. The following reporting requirements described in Sections A.01 Performance (Technical) Reports and B.02 Financial Reports of the DoC Financial Assistance Standard Terms and Conditions dated December 26, 2014, http://go.usa.gov/hKbj, 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 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) Performance (Technical) Reports. Each award recipient will be required to submit a technical progress report to the NIST Grants Officer and Federal Program Officer on a semi-annual basis for the periods ending March 31 and September 30 of each year. Technical progress reports shall contain information as prescribed in 2 C.F.R. § 200.328. Reports will be due within 30 days after the end of the reporting period. A final technical report 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 of the requirements described in Section IV.2.a.(9) of this FFO.

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

b. Audit Requirements. 2 C.F.R. 200 Subpart F, adopted by the Department of Commerce through 2 C.F.R. § 1327.101 requires any non-Federal entity (i.e., including non-profit institutions of higher education and other 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. 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 (Pub. L. 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 contact persons:

Subject Area	Point of Contact
Programmatic and Technical Questions	Gary Anderson Phone: 301-975-5238 E-mail: gary.anderson@nist.gov
Technical Assistance with Grants.gov Submissions	Christopher Hunton Phone: 301-975-5718 E-mail: grants@nist.gov Or www.grants.gov Phone: 800-518-4726 E-mail: support@grants.gov
Grant Rules and Regulations	Nuria Martinez Phone: 301-975-6215 E-mail: nuria.martinez@nist.gov