

May 29, 2015

**ANNOUNCEMENT OF FEDERAL FUNDING OPPORTUNITY (FFO)
Economic Analysis of the National Need for Technology Infrastructure to
Support the Materials Genome Initiative (MGI)**

EXECUTIVE SUMMARY

- **Federal Agency Name:** National Institute of Standards and Technology (NIST), United States Department of Commerce (DoC)
- **Funding Opportunity Title:** Economic Analysis of the National Need for Technology Infrastructure to Support the Materials Genome Initiative (MGI)
- **Announcement Type:** Initial
- **Funding Opportunity Number:** 2015-NIST-TPO-01
- **Catalog of Federal Domestic Assistance (CFDA) Number:** 11.609, Measurement and Engineering Research and Standards
- **Dates:** Applications must be received electronically through Grants.gov no later than 11:59 p.m. Eastern Time, Tuesday, July 28, 2015. Applications received after this deadline will not be reviewed or considered. The earliest anticipated start date for an award under this FFO is expected to be January 2016.
- **Application Submission Address:** Applications will only be accepted using Grants.gov.
- **Funding Opportunity Description:** NIST is soliciting applications from eligible applicants to assess the economic impacts of meeting the Nation's need for technology infrastructure to support the Materials Genome Initiative (MGI). Advanced materials are essential to economic security and human well-being, with applications in industries aimed at addressing challenges in clean energy, national security, and human welfare, yet it can take 20 or more years to move a material after initial discovery to the market. This **prospective** (strategic planning) study involves, at a minimum, expertise 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. The goal of the analysis is to identify gaps in the Nation's technology infrastructure needed to support the MGI and estimate the economic value of eliminating these gaps. The specific goals of this study are to: (1) assess the technological and economic trends in the research, development, adoption and deployment of MGI related

technologies, including demonstrated and anticipated adopters of MGI technology; (2) assess gaps in the technology infrastructure associated with the efficient domestic development of highly complex emerging materials research technologies; (3) assess qualitatively these gaps in terms of industry investment criteria and research mechanisms used, (4) determine the quantitative empirical rankings of the economic benefit of eliminating these gaps based on novel data and modelling; and (5) assess the implied U.S. and international government policy responses, specific to phases in the R&D cycle, technology transfer efforts and subsequent scale-up (capital formation).

- **Anticipated Amounts:** NIST anticipates making one (1) award in the range of approximately \$200,000 per year for up to two years, consistent with the multi-year funding policy described in Section II.2. of this FFO. Proposed funding levels must be consistent with project scope. NIST will consider applications with lower funding amounts.
- **Funding Instrument:** Cooperative agreement.
- **Who Is Eligible:** Eligibility for the program listed in this FFO is unrestricted, that 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; and state, local, territorial and Indian tribal governments within the United States. An eligible organization may work individually or include proposed subawardees, contractors or other collaborators in a project, effectively forming a team or consortium. An eligible organization may only submit one application. Federal agencies may participate in projects but may not receive NIST funding.
- **Cost Sharing Requirements:** This Program does not require cost sharing.

FULL ANNOUNCEMENT TEXT

I. Program Description

The statutory authority for the Economic Analysis of the National Need for Technology Infrastructure to Support the Materials Genome Initiative (MGI) is 15 U.S.C. § 272(b) and (c).

- 1. Funding Opportunity Description.** NIST is soliciting applications from eligible applicants to assess the economic impacts of meeting the Nation's need for technology infrastructure to support the Materials Genome Initiative (MGI). Advanced materials are essential to economic security and human well-being, with applications in industries aimed at addressing challenges in clean energy, national security, and human welfare, yet it can take 20 or more years to move a material after initial discovery to the market.

This prospective (strategic planning) study involves, at a minimum, expertise 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. The goal of the analysis is to identify gaps in the Nation's technology infrastructure needed to support the MGI and estimate the economic value of eliminating these gaps. The specific goals of this study are to: (1) assess the technological and economic trends in the research, development, adoption and deployment of MGI related technologies, including demonstrated and anticipated adopters of MGI technology; (2) assess gaps in the technology infrastructure associated with the efficient domestic development of highly complex emerging materials research technologies; (3) assess qualitatively these gaps in terms of industry investment criteria and research mechanisms used; (4) determine the quantitative empirical rankings of the economic benefit of eliminating these gaps based on novel data and modelling; and (5) assess the implied U.S. and international government policy responses, specific to phases in the R&D cycle, technology transfer efforts and subsequent scale-up (capital formation).

The applicant should focus on infratechnologies and technology platforms, as defined below in Section I.2.f. of this FFO and consider approaches to evaluate these platforms using measurement and test methods, science and engineering data, modeling and simulation, functional interfaces and performance metrics in the context of the MGI (see Section I.2.a. of this FFO). The applicant also should consider expected trajectories particularly for emerging technology platforms. The applicant should aim to characterize technology life cycles with an emphasis on the roles and current status of technical infrastructure (technology platforms, and measurement and other infratechnologies and associated standards) and relate this information to metrics related to potential gains in economic efficiency from larger and better focused investments in such infrastructure.

A complete successful project will include an industry and technical gap analysis, the development of a methodology for empirically estimating the quantitative value of eliminating these gaps, and an approach that is able to guide the design of novel data collection strategies, as applicable to the MGI. Under an award for this Program, the applicant should expect to collaborate with NIST on its data collections, analyses, and the dissemination of results to the public via publications in the scientific literature and on publically available websites. NIST will obtain appropriate Office of Management and Budget clearance for any collection of information that is subject to the Paperwork Reduction Act.

- 2. Background Information.** Background information on the MGI and relevant topical areas in the context of this FFO is provided below. Additional information on the MGI can be found at the following websites: <https://mgi.nist.gov/> and <http://www.whitehouse.gov/mgi>.

- a. **The MGI.** The Office of Science and Technology Policy (OSTP) and Office of Management and Budget (OMB) have called for focused support of Research and Development (R&D) in “advanced manufacturing to strengthen U.S. leadership.”¹ A recent report by the President’s Council of Advisors on Science and Technology (PCAST) and the President’s Innovation and Technology Advisory Committee (PITAC) emphasizes the critical importance of advanced manufacturing in driving knowledge production and innovation in the United States. The PCAST researched the current state of manufacturing and concluded that U.S. leadership in manufacturing is declining and that this is detrimental to the well-being of the Nation overall.

To complement investments in advanced manufacturing, President Obama announced the creation of the MGI in 2011.² This multi-agency effort aims to catalyze a new era of policies, resources and infrastructure that support American institutions as they dramatically cut the time it takes to bring critical material innovations to market. Since the MGI’s launch in 2011, the Federal Government has invested over \$250 million in new R&D and innovation infrastructure that will help anchor emerging industrial sectors in the United States that depend on advanced materials. These investments span federal agencies and include numerous industry-led public-private partnerships. MGI activities will accelerate the development and adoption of cutting edge technologies critical to the ultimate success of a recently launched Institute for Manufacturing Innovation.³ This infrastructure promises to accelerate the development of new high tech materials that can help address a broad range of national goals in the domains of energy, health, transportation, food and agriculture, and national defense.

The MGI aims to significantly reduce the time and cost needed to discover, develop, manufacture, and deploy advanced materials by replacing traditional trial and error approaches with a robust, reliable and open materials innovation infrastructure. This infrastructure couples reliable materials data and materials simulations to carefully designed experiments and enables access to the results of these techniques through advanced methods in data exchange and quality assessment. Finally, the developed infrastructure should enable new methods and metrologies based on the availability of this infrastructure, such as “data-driven” materials science. This materials innovation infrastructure will enable industrial researchers to effectively

¹ See for example: <https://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-advanced-manufacturing-june2011.pdf>; https://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_amp_steering_committee_report_final_july_27_2012.pdf; and http://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/amp20_report_final.pdf.

² See <https://www.whitehouse.gov/blog/2011/06/24/materials-genome-initiative-renaissance-american-manufacturing>.

³ In January 2015, the American Lightweight Materials Manufacturing Innovation Institute (ALMMII) opened a new innovation acceleration center in Detroit and exhibited new technologies that use lightweight metals with a new program name, Lightweight Innovations for Tomorrow (LIFT). See <http://lift.technology/technology-development>.

discover the data and models they need, assess the quality of these data and models, and use these data and models to maximum effect.

- b. MGI and NIST.** MGI integrates tools, theories, models, and data from basic scientific research with the processing, manufacturing, and deployment of materials. The materials innovation infrastructure will enable this integration by providing access to digital resources that contain the property data of known materials as well as the computational and experimental tools to predict these characteristics for new and emerging materials. NIST is now developing the measurement science, tools and standards necessary to enable greatly improved efficiency in the Nation's development and manufacture of new products and services based on innovative materials. This is part of an interagency effort aimed at accelerating industrial innovation by significantly reducing the time and cost needed to discover, develop, manufacture, and deploy advanced materials through the integration of modeling and simulation tools with experimental data and digital data/informatics tools. NIST will develop an enhanced materials innovation infrastructure to enable industrial researchers to effectively exploit these advances to more rapidly incorporate advanced materials into manufactured products. To foster widespread adoption of the MGI paradigm both across and within the multitude of materials development ecosystems, NIST is establishing the essential data exchange protocols and the means to ensure the quality of materials data and models, which will ultimately yield new methods, metrologies, and capabilities necessary for accelerated materials development.
- c. Stakeholders.** The MGI has stakeholders throughout government, academia and industry. In particular, NIST has crucial collaboration with the Center for Hierarchical Materials Design (CHiMaD), as well as key government agencies, including the Department of Energy (DoE), the Department of Defense (DoD), and the National Science Foundation (NSF) via the MGI Subcommittee of the National Science and Technology Committee (NSTC) and key partners and stakeholders throughout the private sector. To date funding from DoE, DoD, and NSF has supported over 500 research scientists at over 200 companies, universities and national labs. More than 20 leading universities have agreed to dedicate facilities, tools, and grant access to data to realize MGI goals.⁴

Amongst its many activities, NIST works closely with U.S. manufacturers that develop, model, and use advanced materials. Indeed, any organization that makes or designs products relies critically upon materials and materials data. NIST also works with professional societies (such as the Materials Research Society, The Minerals, Metals and Materials Society, and ASM International). These organizations and additional professional societies have initiated broad MGI related activities among their 60,000+ members, who provide a substantial resource for collaboration with universities and industry.

⁴ See "FACT SHEET: The Materials Genome Initiative – Three Years of Progress" at: https://www.whitehouse.gov/sites/default/files/microsites/ostp/materials_genome_initiative_-_three_years.pdf.

d. Stakeholders and Potential Economic Impacts. Analysis of the recently released MGI Strategic Plan⁵ demonstrates the potential breadth of the economic impact of the MGI. The plan identifies nine grand challenges that will have a critical impact on national security, human health and welfare, clean energy systems, and infrastructure and consumer goods. To fully realize these impacts, MGI approaches will need to address a variety of crosscutting challenges across a range of classes of materials and a range of applications.

Selected classes of materials are provided in **Table 1** and mapped to demonstrate the potential industries that will be impacted by these classes of materials as a result of the MGI. The MGI Strategic Plan explicitly identifies opportunities and recent successes across the nearly 20 major industries identified in Table 1.

Table 1: Selected Materials Classes and Their Potential Impact on Industry

Materials Classes	Industry Impacted																	
	Oil and Gas Extraction	Mining (except Oil and Gas)	Utilities	Construction of Buildings	Heavy and Civil Engineering Construction	Food Manufacturing	Petroleum and Coal Products Manufact.	Chemical Manufacturing	Plastics and Rubber Products Manufact.	Primary Metal Manufacturing	Fabricated Metal Product Manufacturing	Machinery Manufacturing	Computer/Electronic Product Manufact.	Electrical Equip., Appliance Manufact.	Transportation Equipment Manufacturing	Miscellaneous Manufacturing	Health Care and Social Assistance	Publishing Industries (Software)
Bio Materials						X		X								X	X	X
Catalysts	X		X				X	X	X						X	X		X
Polymer Composites					X			X					X	X	X	X	X	X
Correlated Materials													X	X			X	X
Electronic and Photonic Materials								X					X	X				X
Energy Storage Systems			X	X				X					X	X	X	X	X	X
Lightweight and Structural Materials	X	X		X	X					X	X	X			X	X	X	X
Organic			X	X				X					X	X		X		X

⁵ See https://mgi.nist.gov/sites/default/files/factsheet/mgi_strategic_plan_-_dec_2014.pdf.

Electronic Materials																		
Polymers			X			X	X	X	X						X	X	X	X

Source: NIST analysis of OSTP Materials Genome Initiative Strategic Plan⁵.

A recent National Academies study provided evidence of the benefits of MGI case studies⁶, including reduced R&D costs and cycle times, reduced needs for testing and evaluation of novel materials, and improved product performance. A rate of return of at least 7:1 is noted for applications of materials in gas turbine manufacturing, aerospace vehicle design, automobile engine design, jet engine design and metal fabrication.

- e. **Underinvestment.** Even with the demonstrated impacts noted above, significant research has documented the systematic underinvestment in the types of technical infrastructure needed to realize the aims of the MGI. This underinvestment has caused a complex web of economic problems that systematically decrease private sector returns and diminish private incentives to invest in this technical infrastructure. Notably, in the case of a revolutionary approach such as envisioned in the MGI, prior analysis that identifies uncertainty, or “industry’s limited confidence,” in results derived from MGI models and data is a driving force behind the limited adoption of MGI approaches. Akerlof⁷ shows how uncertainty can diminish the expected value of innovations and in extreme cases eliminate private investment incentives completely. This demonstrates the inefficiency of purely private MGI research and development efforts. Critical technology infrastructure is needed to overcome such barriers to investment in MGI technologies. This infrastructure is equally valuable to all stakeholders (non-rival) and must be available to all stakeholders (non-excludable) to realize its full economic benefit. In the case of the MGI, technical infrastructure that assures the quality and reliability of materials data and modelling is critically important to both materials developers and the manufacturers that will employ these novel materials in the products that they manufacture.
- f. **Technology Infrastructure** is the broad base of quasi-public technologies (technologies with varying degrees of public good 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). It is composed of two elements: infratechnologies and technology platforms.⁸ For the purposes of this

⁶ Integrated Computational Materials Engineering: A Transformational Discipline for Improved Competitiveness and National Security, 2008, <http://www.nap.edu/catalog/12199/integrated-computational-materials-engineering-a-transformational-discipline-for-improved-competitiveness>.

⁷ Akerlof, George (1970). The Market for Lemons: Quality Uncertainty and the Market Mechanism, The Quarterly Journal of Economics, volume 84, number 3, 488-500. See http://www.jstor.org/stable/1879431?seq=1#page_scan_tab_contents.

⁸ For a more thorough explanation of technology infrastructure and its components, please see Gregory Tassey

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 Tassej writes “collectively [infratechnologies] constitute a diverse technical infrastructure, various types of which are applied at each stage of economic activity.”⁹ 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 these 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.

- g. Technology Infrastructure Needs.** For the purposes of this FFO, within the current Technology Infrastructure, there are several key needs that act as critical technology infrastructure barriers that are essential to overcome. Overcoming these barriers offers the opportunity to reverse the trend of transferring both product and production technologies, with the associated creative expertise, overseas to lower-wage regions. It can enable U.S. companies to move from an economies-of-scale focus to an economies-of-scope focus and revitalize the industrial base of small and medium manufacturers. These changes are essential if the United States is to compete successfully as mass-customization becomes the driver of global competitiveness.

Key needs are listed below for both infratechnologies and technology platforms:

- **Infratechnology Needs**
 - New data models, representations, and exchange protocols to improve

(1997). The Economics of R&D Policy, Quorum Books, Westport and Gregory Tassej (2007), The Technology Imperative, Edward Elgar, Northhampton.⁹ Gregory Tassej (2005). Underinvestment in Public Good Technologies, Journal of Technology Transfer, 30 1-2 89-113.

⁹ Gregory Tassej (2005). Underinvestment in Public Good Technologies, Journal of Technology Transfer, 30 1-2 89-113.

ease of use of materials data.

- Curation infrastructure for materials data and models.
 - Measurement science to perform verification, validation, and uncertainty quantification of materials models and simulations.
 - Predictive materials models, incorporating uncertainty budgets, and ability to be integrated through standards and platforms.
 - Validation approaches for physical and chemical properties data and mechanisms of the material system.
 - Standards and methodology for sharing predictive algorithms and computational methods.
 - Software, algorithm and model performance standards.
 - Validation approaches for materials performance models.
 - Materials property data measured as a function of key variables such as composition and processing history.
 - In situ characterization techniques to determine the properties of materials during processing.
 - Computational tools for the rapid screening of materials over a wide range of length and time scales.
- **Technology Platform Needs**
 - New simulation software platforms and an assessment of these platforms.
 - Robust user friendly software tools.
 - Predictive algorithms that model behavior and properties across multiple spatial and temporal aspects.
 - Materials behavior and performance models with significantly improved accuracy relative to what is available today.
 - Predictive materials models, incorporating uncertainty budgets, and ability to be integrated through standards and platforms.

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 (DoC) Grants and Cooperative Agreements Manual, which is available at <http://go.usa.gov/SNJd> . Please note the DoC Grants and Cooperative Agreements Manual is expected to be updated after publication of this funding announcement and before October 1, 2015. 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 an application for a multi-year award is approved, funding will usually be provided for only the first year of the project.

Recipients will be required to submit detailed budgets and budget narratives prior to the award of any continued funding. Continued funding for the remaining years of the project will be awarded by NIST on a non-competitive basis, and may be adjusted higher or lower from year-to-year of the award, contingent upon satisfactory performance, continued relevance to the mission and priorities of the program, and the availability of funds. Continuation of an award to extend the period of performance and/or to increase or decrease funding is at the sole discretion of NIST.

3. **Funding Availability.** NIST anticipates making one (1) award in the range of approximately \$200,000 per year for up to two years, consistent with the multi-year funding policy described in Section II.2. of this FFO. Proposed funding levels must be consistent with project scope. NIST will consider applications with lower funding amounts.

III. Eligibility Information

1. **Eligible Applicants.** Eligibility for the program listed in this FFO is unrestricted, that 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; and state, local, territorial and Indian tribal governments within the United States. An eligible organization may work individually or include proposed subawardees, contractors or other collaborators in a project, effectively forming a team or consortium. An eligible organization may only submit one application. Federal agencies may participate in projects but may not receive NIST funding.
2. **Cost Sharing or Matching.** This Program does not require cost sharing.

IV. Application Submission Information

1. **Address to Request Application Package.** The application package is available at www.grants.gov. Applicants may also request an application package by contacting the point of contact for Programmatic and Technical Questions listed in Section VII. of this FFO.
2. **Content and Form of Application Submission**
 - a. **Required Application Forms and Documents**

The following are required for a complete application:

- (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 2015-NIST-TPO-01.

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

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

- (2) **SF-424A, Budget Information - Non-Construction Programs.** The budget should reflect anticipated expenses for each year of the project for no more than two (2) years, considering all potential cost increases, including cost of living adjustments.
- (3) **SF-424B, Assurances - Non-Construction Programs**
- (4) **CD-511, Certification Regarding Lobbying**
- (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 (20) 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 specifically assess:
 - industry trends and identify gaps in the technology infrastructure,
 - the economic impact, quantitatively and qualitatively, of eliminating the gaps in the technology infrastructure,
 - the implied government policy responses with respect to targets of specific phases in the R&D cycle, technology transfer efforts and subsequent scale-up, and
 - the impacts throughout the supply chain and over the entire innovation lifecycle.

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's 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.

(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.

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

- (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 Section B.06 Indirect or Facilities and Administrative Costs of the Department of Commerce Financial Assistance Standard Terms and Conditions (December 26, 2014), available at <http://go.usa.gov/hKbj>.

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.(8) 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 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 a rejection notification whether NIST has received the application. Validation completes the submission process.***

b. Application Format

- (1) **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 only except for figures, graphs, images, and pictures.
- (7) **Page Limit.** The Technical Proposal for Applications is limited to 20 pages.

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

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, Budget Narrative; and Indirect Cost Rate Agreement.

- (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, Tuesday, July 28, 2015. Applications received after this deadline will not be reviewed or considered. The earliest anticipated start date for an award under this FFO is expected to be January 2016.

Applications not received by the specified due date and time will not be considered and will be returned without review. The date and time stamped on the validation generated by www.grants.gov will be considered as the official submission time that the application was received by NIST. Applicants are cautioned that the validation process may take up to two full business days after the application is submitted to www.grants.gov.

NIST strongly recommends that applicants do not wait until the last minute to submit an application. NIST will not make any allowances for late submissions resulting from an applicants' inability to register with Sam.gov or Grants.gov in a timely manner. The responsibility for ensuring a complete application is received by NIST by the deadline is the sole responsibility of the applicant. To avoid any potential processing backlogs due to last minute Grants.gov registrations, applicants are strongly encouraged to start their Grants.gov registration process at least four (4) weeks prior to the application due date.

When developing your submission timeline, keep in mind that (1) a free annual registration process in the electronic System for Award Management (SAM) (see Section IV.3. of this FFO) may take between three and five business days or as long as more than two weeks, and (2) applicants using Grants.gov will receive a series of receipts over a period of up to two business days before learning via a validation or rejection whether a Federal agency's electronic system has received its application.

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 2015-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 2015-NIST-TPO-01 announcement, contact Christopher Hunton by phone at 301-975-5718 or by e-mail at christopher.hunton@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 authorized individual(s) 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 the “Grant Applicants” page.
- a. In addition to following the “Steps” and instructions described in the “Applicant Actions” section and its sub-categories, further detailed instructions are described in “Applicant Resources” and all of its subcategories. This appears in the box near the top left of the Grant Applicants page. Applicants should follow the links associated with each subcategory.
 - b. Applicants will receive a series of receipts during the validation process, which may take up to two business days before the application is either validated as electronically received by the Federal agency system, or rejected by it. Closely following the detailed information in these subcategories will increase the likelihood of acceptance of the application by the Federal agency’s electronic system.
 - c. Your application must be both *received and validated* by Grants.gov prior to the application deadline. Your application is “received” when Grants.gov provides you a confirmation of receipt and an application tracking number. If you do not see this confirmation and tracking number, your application has not been received. After your application has been received, it must still be validated. During this process, it may be “validated” or “rejected with errors.” To know whether your application was rejected with errors and the reasons why, you 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,” you may still seek to correct the errors and resubmit your application before the deadline. If you do not correct the errors, your application will not be forwarded to NIST by Grants.gov.
 - d. Applicants should pay close attention to the instructions 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.

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 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 Dr. Gary Anderson by telephone at (301) 975-5238 or by e-mail to 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 – 35 points sub-criteria i. through iv. 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:
- i. assess industry trends and identify gaps in the technology infrastructure,
 - ii. assess the economic impact, quantitatively and qualitatively, of eliminating the gaps in the technology infrastructure,
 - iii. assess the implied government policy responses with respect to targets of specific phases in the R&D cycle, technology transfer efforts and subsequent scale-up, and
 - iv. assess the impacts throughout the supply chain and over the entire innovation lifecycle.
- b. **Statement of Work. (0 – 35 points)** 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 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 should result in preparing and publishing data and results from the project in the scientific literature and on publically available websites.

d. Qualifications. (0 - 20 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 the extent to which these factors will contribute to success of the project:

- 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 reviewers will evaluate the applicant's 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.

2. Selection Factors. The Selecting Official, who is the Director of the Technology Partnerships Office, or designee, shall select applications for an award based upon the rank order of the applications (see Section V.3. of this FFO) and may select an application out of rank 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 Program 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 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) independent, 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). All reviewers will be federal employees. 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 select 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. For international applications, NIST will follow applicable U.S. laws and policies. 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 performs administrative reviews, 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. Upon review of these factors, if appropriate, special conditions that correspond to the degree of risk may be applied to the award.
4. **Anticipated Announcement and Award Dates.** Review, selection, and award processing is expected to be completed by December 2015. The earliest anticipated start date for awards made under this FFO is expected to be January 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 three (3) years for record keeping purposes. After three (3) years, it will be destroyed.

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 Financial Assistance Standard Terms and Conditions (December 26, 2014) will apply to this award and are accessible at: <http://go.usa.gov/hKbj>.
 - c. **Department of Commerce Pre-Award Notification Requirements.** The Department of Commerce Pre-Award Notification Requirements for Grants and Cooperative Agreements, 79 FR 78390 (December 30, 2014), are applicable to this FFO and are available at <http://go.usa.gov/hKkR>.
 - 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 obligate 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 Department of Commerce 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 involving human subjects, including software testing, must satisfy the requirements of the Common Rule for the Protection of Human Subjects ("Common Rule"), codified for the Department of Commerce (DoC) at 15 C.F.R. Part 27. Research activities involving human subjects who fall within the classes of subjects found in 45 C.F.R. Part 46, Subparts B, C and D must satisfy the requirements of the applicable subpart. In addition, any such application that includes research activities on these topics must be in compliance with any statutory requirements imposed upon the Department of Health and Human Services (DHHS) and other Federal agencies regarding these topics, all regulatory 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 these topics.

NIST reserves the right to make an independent determination of whether an applicant's activities include research involving human subjects. NIST policy also requires a NIST administrative review for research involving human subjects approved by a non-NIST Institutional Review Board (IRB). (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. 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.

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, if the application is funded. 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.

The applicant should clearly indicate in the application, by separable task, all research activities believed to be exempt or non-exempt research involving human subjects and the expected institution(s) where the research activities involving human subjects may be conducted, and which institutions are expected to be engaged in the research activities.

If an activity/task involves data obtained through intervention or interaction with living individuals or identifiable private information obtained from or about living individuals but the applicant participant(s) believes that the activity/task is not research as defined under the Common Rule, the following information may be requested for that activity/task:

- (1) Justification, including the rationale for the determination and in some cases additional documentation, to support a determination that the activity/task in the application is not research as defined in the Common Rule. See 15 C.F.R. § 27.102 Definitions.
- (2) If the applicant participant(s) uses a cognizant IRB that provides a determination that the activity/task is not research, a copy of that

determination documentation will be required by NIST. The applicant participant(s) is not required to establish a relationship with a cognizant IRB if they do not have one, but if the applicant participant(s) has a cognizant IRB that requires review of the activity/task, or the applicant participant(s) elects to obtain IRB review, a copy of the IRB approval/determination documentation will be required by NIST.

NIST will review the information submitted and may coordinate further with the applicant before determining whether the activity/task will be defined as research for purposes of implementing the Common Rule in the applicable NIST financial assistance program or project.

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 To what does this policy apply?):

- (1) The name(s) of the institution(s) where the exempt research will be conducted; and/or from which biological materials or data from human subjects will be provided.
- (2) 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).
- (3) 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.
- (4) Any additional clarifying documentation that NIST may request during the review process in order to make a determination that the activity/task or use of biological materials or data from human subjects is exempt under the Common Rule (see 15 C.F.R. § 27.101 To what does this policy apply?).

If the application appears to NIST to include research activities (exempt or non-exempt) involving human subjects, and the performer of the activity has a cognizant IRB registered with OHRP, 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.

Additional documentation may be requested by NIST for performers with a cognizant IRB during review of the application, and may include the following for research activities involving human subjects that are planned in the first year of the award:

- (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 may be requested;
- (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 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 Jason Boehm, Director, NIST Program Coordination Office (e-mail:

jason.boehm@nist.gov; phone: (301) 975-8678.

h. Research Applications 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 be in compliance with 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. In addition, such applications must meet the requirements of the Animal Welfare Act (7 U.S.C. § 2131 et seq.), 9 C.F.R. Parts 1, 2, and 3, and if appropriate, 21 C.F.R. Part 58. These regulations 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 sample collection. NIST does require 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.

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.

NIST reserves the right to make an independent determination of whether an applicant's research activities involve live vertebrate animals or custom samples from live vertebrate animals. If NIST determines that the application includes research activities or custom samples involving live vertebrate animals, you will be required to provide additional information for review and approval. If an award is issued, no research activities involving live vertebrate animals subjects shall be initiated or costs incurred under the award until the NIST Grants Officer issues written approval.

If the applicant's application appears to include research activities or custom sample collections involving live vertebrate animals the following information may be requested during the application review process:

- (1) The name(s) of the institution(s) where the animal research 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 (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.

Additional documentation may be requested by NIST during review of the application and may include the following for research activities and/or custom sample collections involving live vertebrate animals that are planned in the first year of the award:

- (1) A signed (by the Principal Investigator) copy of the IACUC approved Animal Study Application (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 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.

For more information regarding research projects involving live vertebrate animals, contact Linda Beth Schilling, Chair, NIST Animal Care & Use Committee (e-mail: linda.schilling@nist.gov; phone: 301-975-2887).

3. Reporting

- a. **Reporting Requirements.** The following reporting requirements described in Sections A.01 Performance (Technical) Reports and B.02 Financial Reports of the Department of Commerce 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 the Federal Program Officer on a quarterly basis for the periods ending March 31, June 30, September 30, and December 31 of each year. Reports will be due within 30 days after the end of the reporting period. A final technical progress report shall be submitted within 90 days after the expiration date of the award. Technical progress reports shall contain information as prescribed in 2 C.F.R. § 200.328. It should also provide overall assessment of program activities and explore opportunities to improve program effectiveness.

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

b. Audit Requirements. 2 C.F.R. Part 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

Subject Area	Point of Contact
Programmatic and Technical Questions:	Dr. 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: christopher.hunton@nist.gov

Subject Area	Point of Contact
	Or Grants.gov Phone: 800-518-4726 E-mail: support@grants.gov
Grant Rules and Regulations	Husai Rahman Phone: 301-975-4355 E-mail: husai.rahman@nist.gov