

**DEPARTMENT OF ENERGY (DOE)
OFFICE OF SCIENCE (SC)
ACCELERATOR R&D AND PRODUCTION (ARDAP)**



**FY2023 RESEARCH OPPORTUNITIES IN ACCELERATOR
STEWARDSHIP AND ACCELERATOR DEVELOPMENT**

**FUNDING OPPORTUNITY ANNOUNCEMENT (FOA) NUMBER:
DE-FOA-0002951**

**FOA TYPE: INITIAL
CFDA NUMBER: 81.049**

FOA Issue Date:	January 10, 2023
Submission Deadline for Pre-Applications:	February 7, 2023, at 5 PM Eastern Time A Pre-Application is required
Pre-Application Response Date:	February 21, 2023
Submission Deadline for Applications:	March 21, 2023, at 11:59pm Eastern Time

Table of Contents

SECTION I – FUNDING OPPORTUNITY DESCRIPTION.....	1
ACCELERATOR STEWARDSHIP	3
TRACK 1: ACCELERATOR STEWARDSHIP TOPICAL AREAS.....	4
TRACK 2: LONG-TERM GENERIC ACCELERATOR R&D	16
TRACK 3: ACCELERATOR STEWARDSHIP TEST FACILITY PROGRAM.....	17
ACCELERATOR DEVELOPMENT.....	18
TRACK 4: ACCELERATOR-TECHNOLOGY SECTOR PRODUCTION ENHANCEMENT	19
ANNUAL MEETINGS	23
TEAMING ARRANGEMENTS	24
SECTION II – AWARD INFORMATION.....	27
A. TYPE OF AWARD INSTRUMENT.....	27
B. ESTIMATED FUNDING	27
C. MAXIMUM AND MINIMUM AWARD SIZE.....	27
D. EXPECTED NUMBER OF AWARDS.....	28
E. ANTICIPATED AWARD SIZE	28
F. PERIOD OF PERFORMANCE.....	28
G. TYPE OF APPLICATION	29
SECTION III – ELIGIBILITY INFORMATION	30
A. ELIGIBLE APPLICANTS	30
B. COST SHARING.....	32
C. ELIGIBLE INDIVIDUALS.....	33
D. LIMITATIONS ON SUBMISSIONS.....	33
SECTION IV – APPLICATION AND SUBMISSION INFORMATION	34
A. ADDRESS TO REQUEST APPLICATION PACKAGE.....	34
B. LETTER OF INTENT (LOI) AND PRE-APPLICATION	34
C. GRANTS.GOV APPLICATION SUBMISSION AND RECEIPT PROCEDURES.....	36
D. CONTENT AND APPLICATION FORMS	36
E. SUBMISSIONS FROM SUCCESSFUL APPLICANTS	56
F. SUBMISSION DATES AND TIMES	56
SECTION V - APPLICATION REVIEW INFORMATION.....	58
A. CRITERIA	58

B. REVIEW AND SELECTION PROCESS	63
C. ANTICIPATED NOTICE OF SELECTION AND AWARD DATES	65
SECTION VI – AWARD ADMINISTRATION.....	66
A. AWARD NOTICES.....	66
B. ADMINISTRATIVE AND NATIONAL POLICY REQUIREMENTS.....	66
C. REPORTING	67
D. REPORTING OF MATTERS RELATED TO RECIPIENT INTEGRITY AND PERFORMANCE (DECEMBER 2015)	67
E. INTERIM CONFLICT OF INTEREST POLICY FOR FINANCIAL ASSISTANCE.....	68
SECTION VII - QUESTIONS/AGENCY CONTACTS.....	69
A. QUESTIONS	69
B. AGENCY CONTACTS.....	69
SECTION VIII – SUPPLEMENTARY MATERIAL	70
A. HOW-TO GUIDES.....	70
B. POLICY PROVISIONS.....	93
C. ADMINISTRATIVE AND NATIONAL POLICY REQUIREMENTS	94
D. REFERENCE MATERIAL	106

UPDATES AND REMINDERS

FREQUENTLY ASKED QUESTIONS

There is a Frequently Asked Questions document, separate from this FOA, posted at <https://science.osti.gov/ardap/Funding-Opportunities>.

RECOMMENDATION

The Department of Energy (DOE) Office of Science (SC) encourages you to register in all systems as soon as possible. You are also encouraged to submit letters of intent (LOIs), pre-applications, and applications well before the deadline.

CURRENT AND PENDING SUPPORT AND BIOGRAPHICAL SKETCHES

The instructions for the content of current and pending support and biographical sketches have changed. Please read the instructions carefully and follow them.

PROMOTING INCLUSIVE AND EQUITABLE RESEARCH (PIER) PLAN

All new and renewal applications must provide a Promoting Inclusive and Equitable Research (PIER) Plan as an appendix to the research narrative. Please read the instructions in [Section IV](#) and the associated review criteria in [Section V](#).

INTERAGENCY FORMATS FOR CURRENT AND PENDING SUPPORT AND BIOGRAPHICAL SKETCHES

Interagency common instructions for preparing current and pending support and biographical sketches are being developed. The Science Experts Network Curriculum Vitae (SciENcv) system at <https://www.ncbi.nlm.nih.gov/sciencv/> will be updated to support the forthcoming common instructions and formats. The fillable PDFs at <https://nsf.gov/bfa/dias/policy/nsfapprovedformats/> may not be available in the future. When interagency common formats and instructions are promulgated, their use will be required. SC strongly encourages all researchers to use the online SciENcv system to ensure that their documents are prepared in the appropriate format with the least inconvenience.

INDIVIDUALS WHO SHOULD NOT SERVE AS MERIT REVIEWERS

Follow the updated instructions in [Section VIII](#) and consider the use of the template available at <https://science.osti.gov/grants/Policy-and-Guidance/Agreement-Forms>. Do not include this list as part of the biographical sketch.

REPORTING AND ADMINISTRATIVE REQUIREMENTS

DOE is implementing enhanced reporting requirements for applications and awards. Reporting and administrative requirements, including but not limited to those pertaining to other sources of support and potential conflicts of interest or commitment, are subject to change before the

Federal award date. The terms and conditions of award will specify changed requirements: Applicants have the right to reject any proposed awards. Terms and conditions may be modified at the time of an award modification: Recipients have the right to reject such modifications and allow an award to expire.

ACKNOWLEDGMENT OF FEDERAL SUPPORT

SC guidance about how its support should be acknowledged is published at <https://science.osti.gov/funding-opportunities/acknowledgements/>.

PUBLIC ACCESS

Awards made under this FOA are subject to DOE's [Public Access Plan](#). Full-text versions of scientific publications must be made publicly accessible at no charge to readers.

LIVING WAGES

SC is committed to ensuring that students, trainees, and postdoctoral fellows are paid a fair and equitable wage sufficient to allow a reasonable standard of living. Applicant institutions are strongly encouraged to examine their institutional pay scales to ensure that all personnel earn a living wage. The provision of fellowships, traineeships, stipends, honoraria, subsistence allowances, and other similar payments are allowable expenses on SC financial assistance awards, even if such payments exceed institutional pay scales. For graduate students, SC considers a reasonable living wage to be an annual income of \$45,000, excluding benefits.

SC STATEMENT OF COMMITMENT

The DOE SC is fully and unconditionally committed to fostering safe, diverse, equitable, and inclusive work, research, and funding environments that value mutual respect and personal integrity. SC is committed to advancing belonging, accessibility, justice, equity, diversity, and inclusion across the portfolio of activities we sponsor. SC's effective stewardship and promotion of safe, accessible, diverse, and inclusive workplaces that value and celebrate the diversity of people, ideas, cultures, and educational backgrounds across the country and that foster a sense of belonging in our scientific community is foundational to delivering on our mission. We are committed to promoting people from all backgrounds, including individuals and communities that were historically underrepresented and minoritized in STEM fields and the activities we sponsor in recognition of our responsibility to serve the public. We also recognize that harnessing a broad range of views, expertise, and experiences drives scientific and technological innovation and enables the SC community to push the frontiers of scientific knowledge for U.S. prosperity and security. Discrimination and harassment undermine SC's ability to achieve its mission by reducing productivity, discouraging, or inhibiting talent retention and career advancement, and weakening the integrity of the SC enterprise overall. SC does not tolerate discrimination or harassment of any kind, including sexual or non-sexual harassment, bullying, intimidation, violence, threats of violence, retaliation, or other disruptive behavior at institutions receiving SC funding or other locations where activities funded by SC are carried out. All

applicants and collaborators should familiarize themselves with the SC Statement of Commitment available at <https://science.osti.gov/SW-DEI/SC-Statement-of-Commitment>.

UPDATING YOUR PORTFOLIO ANALYSIS AND MANAGEMENT SYSTEM (PAMS) PROFILE

All applicants are encouraged to update their profiles in the PAMS website at <https://pamspublic.science.energy.gov> regularly, at least annually, to ensure SC has your most up to date information. The PAMS profile now requires that individuals provide responses to the demographic related fields. SC strongly encourages personnel at applicant and awardee institutions, including Principal Investigators (PIs), Co-PIs, and other Key Personnel, to provide their demographic information. By providing your demographic information, you are assisting with SC's continued commitment to advancing diversity, equity, and inclusion in its business practices. Alternatively, for information you wish not to disclose, please select, "Do not wish to provide." Your individual demographic information will not be shared with peer reviewers and the information in your PAMS profile is protected by the requirements established in the Federal Privacy Act of 1974. Aggregate, anonymized demographic information may be shared with confidential review committees who are charged to evaluate the quality and efficacy of SC's business practices. For example, summary statistics of all applicants to or award selections from a particular SC FOA may be reviewed by a Committee of Visitors.

PORTABLE DOCUMENT FORMAT (PDF) GENERATION

The research narrative in an application must be one single machine-readable PDF file that contains the DOE Title Page, project narrative, all required appendices, and other attachments. This single PDF file may not be scanned from a printed document and must be attached in Field 8 on the Grants.gov form. This must be a plain PDF file consisting of text, numbers, and images without editable fields, signatures, passwords, redactions, or other advanced features available in some PDF-compatible software. Do not use PDF portfolios or binders. The research narrative will be read by SC staff using the full version of Adobe Acrobat: Please ensure that the narrative is readable in Acrobat. If combining multiple files into one research narrative, ensure that a PDF portfolio or binder is not created. If creating PDF files using any software other than Adobe Acrobat, please use a "Print to PDF" or equivalent process to ensure that all content is visible in the research narrative. Once a research narrative has been assembled, please submit the combined research narrative file through a "Print to PDF" or equivalent process to ensure that all content is visible in one PDF file that can be viewed in Adobe Acrobat.

Checklist for Avoiding Common Errors:

Item	Issue
Page Limits	Strictly followed throughout application, including particular attention to: <ul style="list-style-type: none"> - Research Narrative - Appendix 2 Narrative, if any - Biographical sketches - Data Management Plan(s) (DMPs) - Letter(s) of Recommendation, if any
Personally Identifiable Information	None present in the application
Research Narrative	Composed of one PDF file including all appendices
Project Summary / Abstract	Name(s) of applicant, PI(s), PI's institutional affiliation(s), Co-Investigator(s), Co-Investigator's institutional affiliation(s)
DOE Title Page	Follow instructions closely
Budget	Use current negotiated indirect cost and fringe benefit rates
Budget Justification (attached to budget)	Justify all requested costs
Biographical Sketches	Follow page limits strictly and do not include list of collaborators. Attach the biographical sketch to the Senior/Key Person Profile (Expanded) Form.
Current and Pending Support	Ensure complete listing of all activities, regardless of source of funding. Attach the current and pending support to the Senior/Key Person Profile (Expanded) Form.
List of Individuals who Should not Serve as Merit Reviews	Provided as separate file in application
Data Management Plans (DMP)	<ul style="list-style-type: none"> - If referring to an experiment's DMP, describe the relationship to the proposed research - Include a DMP even if no experimental data is expected
Promoting Inclusive and Equitable Research (PIER) Plan	PIER Plans are a new requirement for new and renewal applications.
PDF Files	Ensure that all PDF files comply with the following standards: <ul style="list-style-type: none"> - Files must be machine-readable. - Files may not be scanned from a printed document. - Files must be plain PDF files consisting of text, numbers, and images without editable fields, signatures, passwords,

	<p>redactions, or other advanced features available in some PDF-compatible software.</p> <ul style="list-style-type: none"> - Files must be readable in the full version of Adobe Acrobat - If combining multiple files into one research narrative, ensure that a PDF portfolio or binder is not created. - If creating PDF files using any software other than Adobe Acrobat, please use a “Print to PDF” or equivalent process to ensure that all content is visible.
<p>Institutions capable of being funded through the DOE Field Work System</p>	<p>If National Laboratories and/or DOE sites are permitted to submit under this FOA:</p> <ul style="list-style-type: none"> - Do not create new institutions in the PAMS website. - Submit applications in Grants.gov using the name of the laboratory or site in Field 5 of the SF-424(R&R) application form, not the contractor operating the laboratory or site. <p>Submissions under this FOA will be evaluated for technical merit, but any resulting funding, work, or awards will be made under the laboratory or site’s contract with DOE. No separate financial assistance awards will be made. No administrative provisions of this FOA will apply to the laboratory or any laboratory subcontractor.</p>

Section I – FUNDING OPPORTUNITY DESCRIPTION

GENERAL INQUIRIES ABOUT THIS FOA SHOULD BE DIRECTED TO:

Technical/Scientific Program Contact:

Dr. Eric R. Colby

301-903-5475

Eric.Colby@science.doe.gov

STATUTORY AUTHORITY

Section 646 of Public Law 95-91, U.S. Department of Energy Organization Act

Section 901, et seq. of Public Law 109-58, Energy Policy Act of 2005

Section 10109 of Public Law 117-167, CHIPS and Science Act of 2022

APPLICABLE REGULATIONS

Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, codified at 2 CFR 200

U.S. Department of Energy Financial Assistance Rules, codified at 2 CFR 910

U.S. Department of Energy, Office of Science Financial Assistance Program Rule, codified at 10 CFR 605

SUMMARY

The DOE SC program in Accelerator Research and Development and Production (ARDAP) hereby announces its interest in applications to conduct cross-cutting use-inspired basic research and development (R&D) to advance accelerator science and technology (AS&T) and domestic supplier development that supports SC's activities in physical sciences research, and which is of broader benefit to other U.S. government agencies and industry. Please note that this Funding Opportunity Announcement (FOA) is for cross-cutting R&D and domestic supplier development and that program-specific AS&T R&D is supported through FOAs issued by each SC program.

SUPPLEMENTARY INFORMATION

The following program description is offered to provide more in-depth information on the scientific and technical areas of interest to the ARDAP program.

ARDAP's mission is to support cross-cutting AS&T R&D, use-inspired technology development of relevance to many fields, domestic accelerator technology supplier development, and dissemination of accelerator knowledge and training to the broad community of accelerator users and providers. (More information is available at the program website:

<https://science.osti.gov/ARDAP>). In the interest of fostering a rich ecosystem of R&D

performers and domestic technology suppliers, applications from Minority Serving Institutions¹, Emerging Research Institutions², and institutions with no prior DOE or ARDAP funding are encouraged.

Many federal agencies have a vested interest in the success of accelerator R&D. In addition to the Basic Energy Sciences (BES), Fusion Energy Sciences (FES), High Energy Physics (HEP), Nuclear Physics (NP), and Isotope Production (IP) programs within SC, stakeholders include the DOE National Nuclear Security Administration (NNSA), the DOE Environmental Management Program Office (EM), the National Institutes of Health's (NIH) National Cancer Institute (NCI), the National Science Foundation (NSF) Division of Mathematical and Physical Sciences (MPS), the Department of Defense (DOD) Office of Naval Research (ONR), the DOD Air Force Office of Scientific Research (AFOSR), the Defense Advanced Research Projects Agency (DARPA), the Department of Homeland Security (DHS) Countering Weapons of Mass Destruction Office (CWMD), the National Aeronautics and Space Administration (NASA) Radiation Effects & Analysis Group, and the National Institute of Standards and Technology (NIST) Ionizing Radiation Physics Division, among others. Applicants are advised to learn about the missions of these agencies.

Please note that this FOA is only for cross-cutting R&D opportunities within the ARDAP mission, meaning that R&D proposals must have a recognized impact on more than one of the programs listed above. The SC programs in BES, FES, HEP, NP, and IP routinely issue separate FOAs for programmatic accelerator research and development aimed at developing technologies for facilities needed by their respective programs.

Program Objectives

ARDAP's program includes two mission areas: Accelerator Stewardship and Accelerator Development. Accelerator Stewardship was established in 2014, and Accelerator Development was established in 2022. Accelerator Stewardship is aimed at use-inspired basic R&D and cross-

¹ MSIs are understood broadly to include, but not be limited to, Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), Tribally Controlled Colleges and Universities (TCCUs), Asian American Native American and Pacific Islander Serving Institutions (AANAPISIs), and Alaska Native and Native Hawaiian Serving Institutions. The U.S. Department of Education list of HBCUs in 2022 can be found at: <https://sites.ed.gov/whhbcu/one-hundred-and-five-historically-black-colleges-and-universities/>. The U.S. Department of Education maintains records of institutions eligible for recognition as MSIs at <https://www2.ed.gov/about/offices/list/ope/itudes/eligibility.html>. For the purposes of this FOA, institutions marked in the most recent eligibility matrix as either being eligible to receive funding or as receiving funding will be considered an MSI. These resources are not an exhaustive list.

² Emerging Research Institutions are understood to include those with High Research Activity (i.e., an "R2" classification) according to the Carnegie Classifications of Institutions of Higher Education, which can be found at <https://carnegieclassifications.acenet.edu>. A list of institutions with very high research activity (R1 institutions) is available at https://carnegieclassifications.acenet.edu/lookup/srp.php?clq=%7B%22basic2005_ids%22%3A%2215%22%7D&st_art_page=standard.php&backurl=standard.php&limit=0.50. A list of institutions with high research activity (R2 institutions) is available at https://carnegieclassifications.acenet.edu/lookup/srp.php?clq=%7B%22basic2005_ids%22%3A%2216%22%7D&st_art_page=standard.php&backurl=standard.php&limit=0.50.

cutting basic R&D to test new applications of accelerator technology, with a goal of up to TRL-4³, but no explicit MRL⁴ goal. Accelerator Development is aimed at strengthening domestic suppliers of critical accelerator technology, with a goal of up to TRL-6 *and* MRL-5 to -7.

Table 1: Summary of FOA Tracks, Aims, Funding Amounts, and Requirements

	Application Track	Aim	TRL Goal	MRL Goal	Typical Award	Teaming	Voluntary Cost Commitment	Application Length
Accelerator Stewardship	Track 1	Use-inspired basic R&D	≤TRL-4	None	\$2M/3 yrs	Required	Strongly Encouraged	16 pages
	Track 2	Cross-cutting basic R&D	≤TRL-4	None	\$0.5M/3 yrs	Encouraged	Encouraged	16 pages
	Track 3	DOE Test Facility Access for R&D	≤TRL-4	None	\$300k/1 yr	Required	Encouraged	5 pages
Accelerator Development	Track 4a	R&D leading to Strategic Plans	(planning)	(planning)	\$200k/1 yr	Required	Encouraged	6 pages
	Track 4b	R&D Partnerships with private sector	≤TRL-6	≤MRL-7	\$2M/2 yrs	Required	Strongly Encouraged	18 pages

Accelerator Stewardship

The central goals of Accelerator Stewardship are to:

- Engage the expertise and facilities of the existing U.S. accelerator R&D ecosystem in a manner that enhances the ability of research sponsors to support innovative concepts;
- Enhance the accelerator technology capabilities of U.S. industry;
- Facilitate access to the accelerator R&D capabilities at the SC National Laboratories⁵
- Drive a limited number of specific accelerator applications towards practical, testable prototypes in a five to seven (5-7) year timeframe;
- Foster collaboration between developers of accelerator technology and experts who apply accelerator technology; and
- Provide the basic R&D foundation necessary for sustained innovation across a broad range of accelerator applications.

This section of the FOA focuses on the following three distinct activities:

³ TRL – Technology Readiness Level, for definitions see DOE G 413.3-4A Chg 1 (Admin Chg) (2015) <https://www.directives.doe.gov/directives-documents/400-series/0413.3-EGuide-04-admchg1>.

⁴ MRL – Manufacturing Readiness Level, for definitions see <https://www.manufacturingusa.com/reports/national-network-manufacturing-innovation-preliminary-design>.

⁵ SC sponsors ten of DOE’s National Laboratories: Ames Laboratory, Argonne National Laboratory, Brookhaven National Laboratory, Fermi National Accelerator Laboratory, Lawrence Berkeley National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Princeton Plasma National Laboratory, SLAC National Accelerator Laboratory, and Thomas Jefferson National Accelerator Facility. The other DOE National Laboratories (Idaho National Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, National Energy Technology Laboratory, National Renewable Energy Laboratory, Sandia National Laboratories, and Savannah River National Laboratory) are outside the scope of the Accelerator Stewardship program.

1. Applied research⁶ that is focused on developing a prototype in response to a specific technical challenge.
2. Basic research that broadly impacts many accelerator applications.
3. Facilitating access to accelerator R&D capabilities at SC-sponsored National Laboratories for academic research.

These activities are divided into three separate “Tracks” in this FOA. Applications must address a topic in one Track **only**. Topics may not be combined between Tracks as the application format, eligibility requirements, project duration, funding limitations, and merit criteria differ significantly.

Applicants are encouraged to review the Accelerator Stewardship Awards made to date at the webpage: <https://science.osti.gov/ardap/Funding-Opportunities/Awarded-RD-Activities>.

Applications that are intended to meet specific BES, FES, HEP, NP, or IP programmatic research needs should be submitted in response to the Funding Opportunity Announcements issued by those Offices. This FOA is for research that is cross-cutting (i.e., applicable to multiple Office of Science programs) only.

Applications that are not in direct support of a topic under the Tracks below (e.g., conferences, experimental operations, specific project R&D or fabrication) must be submitted to the FY 2023 Continuation of Solicitation for the Office of Science Financial Assistance Program (DE-FOA-0002844).

Track 1: Accelerator Stewardship Topical Areas

Accelerator Stewardship Topic Areas are focused R&D efforts aimed at solving a specific accelerator application problem in a specific area. The desired end goal after one to two (1-2) grant cycles (e.g., three to six (3-6) years) is a working prototype technology at TRL-4. This Track has broad eligibility requirements, see [Section III.A](#) for more information. Teams, comprising at a minimum an accelerator technology partner and an application partner, are expected to apply in this area, and develop an application that clearly defines the technology development pathway, teaming and management plan, IP allocation, and market opportunity (where applicable).

Applicants **must** provide evidence of the Stewardship Customer’s⁷ commitment to the proposed activity. This commitment may take the form of uncompensated effort; the provision of surplus materials, supplies, or equipment; the provision of access to facilities at no or reduced cost;

⁶ The term “applied research” is used here in a manner consistent with colloquial usage in the field of accelerator R&D, referring to research that is in the early stages of development (Technology Readiness Level [TRL] 1-4) and encompasses work leading to a first prototype that demonstrates scientific feasibility. It does not include R&D leading to a demonstration of suitability for a particular application nor does it include R&D supporting commercialization of a product. In the context of DOE’s authorizing legislation all work supported here is of a basic or fundamental nature.

⁷ “Stewardship Customer”, or more generically, “stakeholder” is defined and examples of evidence of support are given in [Section V.A.2](#).

voluntary cost sharing; mentoring, training, or coaching of personnel; or other methods of involving the Stewardship Customer in the proposed activity. See [Section III.B](#) for more information.

The following are four topic areas active in Track 1 of this FOA:

- a) Particle Therapy Beam Delivery Improvements.
- b) Ultrafast Laser Technology Program.
- c) High Power Electron Accelerator Technology for Industrial Applications.
- d) Compact Accelerator Technologies for Security and Medicine.

Applications submitted under Track 1 should address specific research goals in only **one** of these topical areas.

In addition to the standard merit criteria applied to all scientific applications, applications submitted under Track 1 will be specifically reviewed for (1) the strength and breadth of the collaborative team and (2) the quality of the technology R&D plan. See [Section V.A.2](#) for a description of the Merit Review Criteria, and [Section V.B.2](#) for a description of the selection criteria.

(a) Particle Therapy Beam Delivery Improvements
Technical Contact: Eric Colby, 301-903-5475, Eric.Colby@science.doe.gov

Even with less than fully optimized treatment techniques, there have been reports of impressive local control rates using particle beam therapy for otherwise difficult-to-treat cancers. Although lower-cost proton beam options are starting to appear, today's proton beam facilities are costly to build and thus are not widely available. Based on their potential biological advantage, there is now increasing medical interest in exploring the use of other light ions for therapy; typically, beams up to carbon are considered.

While beam delivery ("gantry") systems for proton beams have been designed and constructed previously, they are typically large, massive, and costly. Accommodating heavier beams, up to carbon, with similar technology requires delivery systems that are even more massive.

Short dose deposition times, on the order of seconds, will require fast and efficient scanning in all three spatial dimensions. This will place new demands on the accelerator, beam line and detector systems to guide and verify dose placement.

Applications in this topical area should address ideas for providing one or more of the following:

1. less massive and more compact beam delivery systems capable of delivering ion beams from protons up to carbon that are suitable for patient therapy;
2. technology that can provide for rapid (seconds) scanning of the beam over a tumor volume in three dimensions (that is: both transversely and longitudinally);
3. beam diagnostic technologies for ion beam therapy, with emphasis on increased readout speed and accuracy of position and dose.

To meet the teaming requirement, applications under this Track 1 topic area **are strongly encouraged to** include significant participation from all three of the following: (1) an institution with technical leadership in a relevant accelerator technology, (2) a medical institution with clinical experience in imaging and treatment for external beam radiotherapy (EBRT), and (3) a domestic company currently manufacturing EBRT products. Applications lacking significant participation from any of the three may score poorly under merit review.

The Particle Therapy Beam Delivery Improvements program of this FOA does **not** request designs for accelerators themselves but covers only ancillary devices that work in conjunction with an accelerator. Applications to design an accelerator or accelerator complex are outside the scope of this FOA, and such application will be declined without review. Designs that are independent of the proton or ion beam accelerator, such that they can work with more than one type of accelerator, are preferred.

Further, applications on beam diagnostic technologies for ion beam therapy are limited to diagnostics applied to the charged particle beam prior to its exit from the nozzle. Imaging technologies downstream of the nozzle, radiobiological studies, and clinical studies are supported by the National Cancer Institute, and applications in any of these topic areas will be declined without review.

Interested applicants are strongly encouraged to review the report of the workshop on Ion Beam Therapy, held January 9-11, 2013. The report provides an overview of the technical issues and required R&D to develop accelerator technologies for ion beam treatment of cancer. The report is available online at https://science.osti.gov/-/media/hep/pdf/accelerator-rd-stewardship/Workshop_on_Ion_Beam_Therapy_Report_Final_R1.pdf.

(b) Ultrafast Laser Technology Program
Technical Contact: Eric Colby, 301-903-5475, Eric.Colby@science.doe.gov

Lasers are used or proposed for use in many areas of accelerator applications: as drivers for novel accelerator concepts for future colliders; in the generation, manipulation, and x-ray seeding of electron beams; in the generation of electromagnetic radiation ranging from THz to gamma rays; and in the generation of neutron, proton, and light ion beams. In many cases, ultrafast lasers with pulse lengths well below a picosecond are required, with excellent stability, reliability, and beam quality. With applications demanding ever-higher fluxes of particles and radiation, the driving laser technology must also increase in repetition rate—and hence average power—to meet the demand.

These applications have some general technological requirements in common which include the following:

- Ultrafast pulses (<1 ps).
- High average powers (>1 kW up to 100 kW or more).
- Diffraction limited beams.
- Good (ps) to excellent (fs) pulse timing.
- Robust and reliable operation.

Many important applications also require, or can benefit from the following:

- High pulse energy (>0.01 J up to 1 kJ).
- High pre-pulse power contrast (better than 10^{-9}).
- High wall plug efficiency (>20% with a goal of 30% or higher).
- Longer laser wavelengths (>1.5 μm out to 10 μm).

The primary goals of the Ultrafast Laser Technology Program are to develop the enabling technologies that will ultimately lead to construction of demonstration prototypes for one or more of the principal types of ultrafast lasers needed for accelerator applications, and to enhance industry's capability to produce the necessary technologies.

Ultrafast lasers for accelerator applications fall into four broad laser types:

- Type I laser systems are used both to directly power laser-driven accelerators-on-a-chip, and as subassemblies of coherently combined fiber arrays used to generate higher pulse energies.
- Type II laser systems are used to excite plasma waves for particle trapping and high gradient acceleration, and for the generation of x-rays through Compton backscattering.
- Type III laser systems are used for generating high repetition rate radiation pulses through nonlinear processes, particularly high-harmonic generation (HHG).
- Type IV laser systems are used for plasma-based sources of protons, light ions, and neutrons.

The target performance parameters for each of the four ultrafast laser types are summarized in Table 2 below.

Table 2. Target performance parameters for the four principal types of ultrafast lasers

	Type I	Type II	Type III	Type IV
Wavelength (μm)	1.5-2.0	0.8-2.0	2.0-5.0	2.0-10.0
Pulse Energy	3 μJ	3 J	0.03-1 J	300 J
Pulse Length (fs)	300	30-100	50	100-500
Repetition Rate	1-1000 MHz	1 kHz	100 kHz	100 Hz
Average Power (kW)	Up to 3	3	3 and up	30
Energy Stability	<1%	<0.1%	<1%	<1%
Beam Quality	$M^2 < 1.1$	Strehl > 0.95	$M^2 < 1.1$	$M^2 < 1.1$
Wall-plug Efficiency	>30%	>20%	>20%	>20%
Pre-Pulse Contrast	N/A	$> 10^{-9}$	N/A	$> 10^{-9}$
CEP-capable	Required	N/A	Required	N/A
Optical Phase Noise	<5°	N/A	<5°	N/A
Wavelength Tunability Range	0.1%	0.1%	10%	0.1%

This initial phase of the Laser Technology Program will concentrate on basic research and engineering design studies to produce the breakthroughs in technology and design architecture necessary to make each of the four laser types practical. Applications are sought in these five topical areas:

- (1) **Ultrafast gain materials capable of very high average power.** Development of materials suitable for fiber or bulk usage, supporting amplification of <100 fs pulses, with excellent thermal conductivity, low thermal lensing, low saturation fluence, high damage threshold and

small quantum defect will be key to increasing average power capabilities of ultrafast lasers. Materials must be scalable to average powers in the kilowatt range and above while maintaining excellent beam quality.

- (2) **Increased robustness and reduction in size of optical components.** Each will reduce the cost of ultrafast laser systems. Development of ultrafast optical coatings and materials capable of supporting <100 fs laser pulses with significantly increased damage threshold, excellent thermal stability, and low loss and low scatter will permit more compact, higher reliability ultrafast lasers to be developed.
- (3) **Innovations in laser architectures, cryogenics, other advanced thermal management techniques.** Direct diode pumping, coherent combination, hybrid fiber/bulk systems, and the use of advanced cryogenic systems will be needed to significantly increase the average power performance of ultrafast lasers.
- (4) **Wavelength extension further into the infrared.** The development of efficient, robust, cost-effective ultrafast laser systems out to 10 microns in wavelength will enable new applications such as solid-state seeding for ultrafast CO₂ lasers and driving HHG hard x-ray generators, as well as open new opportunities in plasma acceleration and high harmonic generation. Significant increases in repetition rate are needed to achieve high average power.
- (5) **Improvements in laser quality.** Advances in pulse contrast, optical phase noise, flexible pulse shaping (both transverse and longitudinal), and precision synchronization to external references will directly impact both the quality and capability of the laser-based sciences.

The Ultrafast Laser Technology Program of this FOA includes initial R&D to identify promising technical avenues for developing ultrafast lasers of the four types discussed above. It does **not** include the engineering and construction of full-scale demonstration laser systems for any of the four types during this initial phase. Applications to develop full-scale demonstration laser systems are out of the scope of this FOA and will be declined without review.

To meet the teaming requirement, applications under this Track 1 topic area **are strongly encouraged to** include significant participation from each of the following: (1) an institution with technical leadership in a relevant laser technology, and (2) an institution with technical leadership in the application of laser technology to accelerators and/or (3) a domestic company currently marketing related laser products. Applications lacking significant participation from a laser technology or accelerator technology partner, or an industry partner, may score poorly under merit review.

Interested applicants are strongly encouraged to review the report of the workshop on Laser Technology for Accelerators, held January 23–25, 2013. The report provides an overview of the technical issues and required R&D to develop ultrafast laser technology for accelerator applications. The report is available online at

https://science.osti.gov/~media/hep/pdf/accelerator-rd-stewardship/Lasers_for_Accelerators_Report_Final.pdf.

(c) **High-Power Electron Accelerator Technology for Industrial Applications**

Technical Contact: Eric Colby, (301)-903-5475, Eric.Colby@science.doe.gov

Particle accelerator technologies have been applied to solve a range of issues in the energy & environmental (E&E) area including: treating potable and wastewater, removing pollutants from stack gases, increasing the energy efficiency of industrial material processing, remediating water-borne and soil-borne contaminants, and replacing radioactive sources in sterilization applications. In many cases the use of accelerator technology for these applications offers important performance advantages. Some of these energy and environmental applications are currently served by existing non-accelerator-based technologies; however, continued improvements in accelerator technology has lowered the cost and increased the reliability of this technology, opening the possibility of broader use in energy and environmental applications.

These applications have some general technological requirements in common which include the following:

- The need to expose significant mass streams to kGy-class radiation fields, requiring:
 - Very high average beam powers (>500 kW up to 10 MW)
 - High wall plug efficiency (>50%)
- The need to operate economically in harsh industrial environments:
 - Low capital and operating costs
 - Robust, reliable, turn-key operation

The primary goals of the High-Power Electron Accelerator Technology program are to develop the enabling technologies that may ultimately lead to construction of demonstration prototypes for one or more of the principal types of high power electron accelerators needed for E&E applications, and to enhance industry’s capability to produce the necessary technologies.

The general requirements for high power electron accelerators for E&E applications were identified at a workshop (see references below) and can be divided into four basic types of accelerators, summarized in Table 3 below.

Table 3. Target performance for high-power electron accelerators for E&E applications:

	Type 1 Demo/Small Scale	Type 2 Medium Scale Low Energy	Type 3 Medium Scale High Energy	Type 4 Large Scale High Energy
<i>Example Applications</i>	<i>R&D, Sterilization, industrial effluent streams</i>	<i>Flue Gas, Wastewater</i>	<i>Wastewater, sludge, medical waste</i>	<i>Sludge, Medical waste, Env. remediation</i>
Electron Beam Energy	0.5-1.5 MeV	1-2 MeV	10 MeV	10 MeV
Electron Beam Power (CW)	>0.5 MW	>1 MW	>1 MW	>10 MW
Wall plug Efficiency	>50%	>50%	>50%	>75%
Target Capital Cost*	<\$10/W	<\$10/W	<\$10/W	<\$5/W
Target Operating Cost†	<1.0M\$/yr	<1.5M\$/yr	<1.5M\$/yr	<12M\$/yr

*Total cost of the accelerator, including all supporting systems (e.g., power, cooling, control, safety).

†Total operating cost including all labor, supplies, repairs, and electricity costs.

- **Demo or Small Scale Systems** are used for processing low-density material streams (gas or

liquid) in moderate quantities, such as industrial effluent streams at flows of order 0.1-0.2 MGD, depending on dose. (1 MGD=1 million gallons per day).

- **Medium Scale Low Energy Systems** are used for processing low-density material streams (gas or liquid) in high volumes, such as for electron beam treatment of flue gases at flow rates of 100,000-200,000 Nm³/hr, and wastewater treatment at flows of 1-1.5 MGD.
- **Medium Scale High Energy Systems** are used for processing high-density materials (solids and sludges) in moderate volumes, such as for medical waste sterilization and sludge treatment at mass flow rates of 20-70 kg/s.
- **Large Scale High Energy Systems** are proposed for use in processing large volumes of high-density materials, such as for environmental remediation of contaminated soil, medical waste sterilization, and sludge treatment at mass flow rates of 0.2-0.7 metric ton per second.

The High-Power Electron Accelerator Technology for Industrial Applications Program has completed a set of feasibility studies and will focus in this next phase on achieving the necessary advances in efficient Radio Frequency (rf) power production and low-cost accelerator structures. Applications submitted under this topic are to be for multi-year use-inspired R&D concepts leading to achievement of the stated performance metrics. Applications which do not directly address all the metrics of the subtopic area will be declined without review.

- a. **High Efficiency High Average Power RF Sources.** The very high-power accelerators required for energy and environmental applications will require highly efficient, low-cost sources of radiofrequency power. R&D to significantly improve the power efficiency of high-average-power (CW or high duty factor) radiofrequency tubes is sought. Net tube power efficiency (including focusing magnet power) must exceed 80%, and *average* tube power must exceed 250 kW, with a pulse format (peak power, pulse length) that is appropriate for either normal conducting or superconducting accelerators, and an output that is stably phase locked to an external reference. The proposed device must provide an economical route to producing 1 MW or more of average power by scaling, coherent combination, or both, at an rf tube cost that does not exceed \$1.50 per watt of average power output. ***A detailed estimate of the tube's production cost must be included in Appendix 6 to support claims that the cost metric will be met.*** There is particular interest in rf power sources operating at frequencies that are in widespread use at the large SC accelerators⁸.
- b. **Economical Accelerator Structures for Megawatt-Class Beams.** Providing low-cost very high-power accelerators for energy and environmental applications will require advances in the design and manufacture of accelerator structures to increase performance and reduce cost. R&D applications are sought for accelerator structures that are optimized for very high-power transfer efficiency into high beam currents and optimized for low production cost and low operation cost for industrial use. Proposed R&D must lead to an accelerator design and a single-unit prototype structure that meets one of the following sets of requirements:
 - i. superconducting radiofrequency, 1 MeV total voltage gain, 1 MW total power coupled to beam, 90% minimum rf-to-beam-power coupling efficiency, costing less than \$1.50/watt fully dressed (including couplers, cryostat, cryocoolers, magnetic and

⁸ See <https://science.osti.gov/user-facilities/user-facilities-at-a-glance/>.

- thermal shields); or
- ii. superconducting radiofrequency, 10 MeV total voltage gain, 1 MW total power coupled to beam, 90% minimum rf-to-beam-power coupling efficiency, costing less than \$3.00/watt full dressed (including couplers, cryostat, cryocoolers, magnetic and thermal shields); or
 - iii. normal conducting radiofrequency, 1 MeV total voltage gain, 1 MW total power coupled to beam, 90% minimum rf-to-beam-power coupling efficiency, costing less than \$0.50/watt fully dressed (including couplers, vacuum enclosure, cooling systems).

The voltage gain and coupled power requirements may be met by using multiple accelerating cavities, but the cost metric then applies to the entire system. ***A detailed estimate of the accelerator structure's production cost must be included in Appendix 6 to support claims that the cost metric will be met.*** Note that in all cases, the cost metric does not include the cost of rf power generation and transmission to the accelerator, nor does it include peripheral systems such as the electron source, beam focusing and delivery, controls and diagnostics, shielding enclosures, etc. At a minimum, the prototype accelerator structure must be experimentally demonstrated to work at the required duty factor, at full accelerating voltage, without beam, but with performance characteristics that are consistent with accelerating 1 MW of beam. There is particular interest in rf accelerators operating at frequencies that are in widespread use at the large SC accelerators⁹.

The High-Power Electron Accelerator Technology program of this FOA includes initial R&D to identify promising technical avenues for developing very high-power electron accelerators of the four types discussed above. It does **not** include the engineering and construction of full-scale accelerator installations for any of the four types during this initial phase. Applications to develop a full-scale accelerator installation are out of the scope of this FOA and will be declined without review.

To meet the teaming requirement, applications under this Track 1 topic area **are strongly encouraged to** include significant participation from each of the following: (1) an institution with technical leadership in a relevant accelerator technology, (2) an institution with technical experience in applying accelerator technology to the energy or environmental application proposed, and/or a domestic company currently marketing related technology. Applications lacking significant participation in either of these two areas may score poorly under merit review.

References

As background, workshops were conducted to identify the accelerator technology research directions with the potential for high impact in E&E applications. Workshops relevant to this topic area include:

- *Workshop on Energy and Environmental Applications of Accelerators*, Edited by Stuart Henderson and Thomas Waite, (2015).

⁹ See <https://science.osti.gov/user-facilities/user-facilities-at-a-glance/>.

https://science.osti.gov/~media/hep/pdf/accelerator-rd-stewardship/Energy_Environment_Report_Final.pdf.

- *Accelerators for America's Future*, Edited by Walter Henning and Charles Shank, (2009). <https://science.osti.gov/~media/hep/pdf/accelerator-rd-stewardship/Report.pdf>.

(d) Compact Accelerator Technologies for Security and Medicine

Technical Contact: Eric Colby, (301)-903-5475, Eric.Colby@science.doe.gov

Accelerators are used as sources of high-energy x-rays and electrons for a variety of applications in security and medicine. Many of these applications can be significantly impacted in the near term by translating advanced component and system technologies from scientific research labs towards commercial applications and by developing use-inspired benchtop demonstrators in the next 3-6 years. For some applications, the adjustability of an accelerator source (in energy, energy spectrum, beam current, and power) could offer important performance gains. Similarly, the time structure of such a source could allow noise reduction and/or time resolved measurements. For some applications, the presently available source is a radioactive isotope-filled capsule, which poses a security risk.

This group of applications have some general technological requirements in common which include the following:

- Compactness of the source
 - Often 10cm x 10cm x 30cm or less (including the electron source, accelerator, target/convertor, but not including supporting equipment)
- Primary (electron) beam energies in the <10 MeV range
 - Although some applications call for much more to produce narrowband x-rays
- A wide range of energy adjustability
 - Typically by at least a factor of two (2), often by a factor of 10 or more
 - Often on a shot-by-shot basis
- A wide range of current adjustability
 - Typically by two to four (2 – 4) orders of magnitude
 - Often on a shot-by-shot basis
- Moderate primary beam power
 - Many applications are in the 50 W-500 W range, but some battery-powered applications require 1 W, and several other applications require 1 kW or more
- Robustness and reliability
 - Most applications need a source that can be used for thousands of hours without expert intervention
- Cost Competitiveness
 - Most applications require an overall source cost (including power supplies, cooling, controls, etc.) of less than \$1M, some applications require total source cost < \$100K.

The general requirements for high power electron accelerators for security and medical applications were identified at a 2019 workshop (see references below) and can be grouped into four basic types of accelerators, summarized in Table 4 below.

Table 4. Four types of compact electron accelerators to drive advanced security and medical applications

	Type I	Type II	Type III	Type IV
General Type	Ultra-low Power Portable	Low- to Moderate-Power	Moderate- to High-Power	High Energy
Example Applications	Emergency Response	Portable Conventional Radiotherapy, Radiography, Down well (DW), Chip & Circuit Inspection (CCI), Electronic Brachytherapy (eB), FLASH-RT (FRT) including VHEE, Pre-clinical RT Machines (PCRT)	Secondary Screening (SS), High Energy Density Physics (HEDP), Non-Destructive Testing (NDT)	NRF, Ptychography, XFEL, MPS for screening, MPS for radiography
Energy Tuning Range	0.3-4 MeV	0.1-14 MeV	0.1-10 MeV	6-1500 MeV
Beam Power	1 W	eB: 50 W FRT, CCI, DW: 100 W Others: 300-500 W	HEDP: 500 W NDT, SS: 1000 W	100 W
Desired Maximum Size (accelerator only)	10x10x30 cm	eB: 1x1x1 cm NDT, DW: 10 Dx22 L cm PCRT 20x20x25 cm Others: 10x10x60 cm	SS, HEDP:10x10x60 cm	NRF, Screening : 10x10x60 cm Ptychography: 20x20x250 cm XFEL: <10 m long
Special Features	LER: <12 kg, battery power, <300 W HER: <50 kg, line power, <1.2 kW	eB: Can be sterilized Inspection: 50 micron spot size Down well: 200 C operation	Inspection: Spot size <1 micron	NRF: 1-7 MVp tuning range XFEL: <5 micron spot size, <50 fs pulse length Ptychography: 0.5-4 micron spot size, 0.1% energy spread
Target Capital Cost	<\$100k	eB: <\$600k NDT, Down well: <\$200k Others: <\$1M	<\$1M	XFEL, ptychography: <\$20M

- **Ultra-low Power Portable** systems – designed primarily for emergency response to perform radiography on either moderate density or high-density objects. These systems must be person-portable, rely on either battery power or limited line power, and be low cost. Beam energies range from a few hundred kilovolts to 4 MeV at less than a watt of beam power to provide broadband (i.e., bremsstrahlung) photons from 300 kVp-4 MVp.
- **Low- to Moderate-Power** systems – designed to provide either electron beams up to 250 MeV for cancer therapy, or to provide higher fluence photon sources in the 100 kVp-14 MVp range. Beam power requirements range from 50 Watts to more than 500 W to provide the necessary fluence. Some uses require ultracompact formats—for example electronic brachytherapy sources must fit in an endoscope, and down-well source must fit in a 10 cm bore. For cancer therapy dose control must be very precise (2%), for still other applications spectral agility is important.
- **Moderate- to High-Power** systems – designed to provide high- to very-high-flux photon

sources for high speed inspection of dense objects, sterilization of medical devices, food, and sterilize harmful insects. Photon energies in the 300 kVp-10 MVp range are needed, with beam powers ranging from 500 Watts to more than 1 kW to provide the necessary fluence.

- **High Energy systems** – designed to provide extremely narrowband and/or coherent sources of photons. These devices are typically not bremsstrahlung sources but require more complex radiation generation processes such as inverse Compton scattering or undulator radiation to produce photons in the required energy range and narrow bandwidth. These systems typically require energies on the order of 1 GeV and while beam power requirements are modest, beam quality becomes critical.

The primary goals of the Compact Accelerator Technology program are to (1) develop the enabling technologies that may ultimately lead to demonstration prototypes of one or more of the principal types of compact electron accelerator needed for security and medical applications, and to (2) enhance domestic industrial capability to produce the necessary technologies.

(1) BASIC R&D ON COMPACT ACCELERATOR TECHNOLOGY

This initial phase of the Compact Accelerator Technology program will concentrate on use-inspired basic research to produce the breakthroughs in technology necessary to make each of the four compact accelerator types practical. Applications are sought in these three topical areas:

1. High gradient radiofrequency accelerator technology. Applications for significant advances in normal conducting radiofrequency accelerator technology meeting the challenging Space Weight and Power (SWaP) and cost requirements in Table 4 are sought. The application must clearly define the R&D milestones and technical pathway to meeting the energy, beam power, and SWaP requirements defined for one of the accelerator types identified in Table 4 within 3-6 years. *A detailed estimate of the accelerator's expected production cost must be included in Appendix 6 to support claims that the cost metric will be met.*

2. Efficient x-ray generation techniques. Innovations in electron-driven photon generating technologies usable in the 60 kVp to 14 MVp range with significantly improved electron-to-photon conversion efficiency (as compared to optimized bremsstrahlung production) and improved spectral selectivity (e.g., <20% BW) are sought in a compact device that will withstand the required input electron beam power for one of the four types identified in Table 4.

3. Design principles for “expert” accelerator control systems. Applications to advance the design methodology for accelerator control systems are sought. Innovations in the systems integration of diagnostics, controls, data archiving, real-time simulation, data processing, and feedback are sought which incorporate modern data-science methods (e.g., machine learning, artificial intelligence) and support rigorous verification and validation. Please note that while portions of an example control system may be built to demonstrate design principles and methodology, the primary goal of this topic is to advance the underlying design principles and methodology.

(2) DESIGN STUDIES FOR COMPACT ACCELERATOR SYSTEMS

Proposals submitted under this subtopic must be for design studies lasting no more than 1 year and requesting no more than \$200,000. The product at the end of award period must be the design report, which responds fully to all seven questions listed below. Proposals that include equipment costs or R&D costs (beyond the limited engineering and simulation work needed to complete the design study) will be declined without review.

- c. **Accelerator Designs for Compact Accelerator Systems.** Compact accelerators must meet all performance metrics for one or more of the accelerator types listed in Table 4, and address application-specific requirements identified by the Compact Accelerators workshop report (see reference below). The product must be a report describing a conceptual design with, at a minimum:
- i. Physics calculations and simulations that support the e-beam production, acceleration, and conversion to x-rays (unless for direct e-beam applications such as VHEE or eB);
 - ii. Engineering calculations and simulations for key components (e.g., thermomechanical simulations of heat transport and thermal expansion) including preliminary tolerance analysis for critical parameters;
 - iii. A preliminary discussion of beam diagnostics and accelerator controls needed for reliable turn-key operation;
 - iv. A discussion of radiation shielding, and anticipated maintenance issues associated with any expected beam losses;
 - v. An estimate of the achievable uptime, and a discussion of staffing requirements to operate and maintain the accelerators with high availability;
 - vi. A preliminary analysis of the anticipated capital and operating costs of a commercially produced accelerator based on the design;
 - vii. A narrative describing the R&D needed to realize the technical and manufacturing advances necessary to put a viable commercial product on the market.

The Compact Accelerator Technologies program of this Announcement includes initial R&D to identify promising near-term technical avenues for developing compact electron accelerators of the four types discussed above, and advanced radiation generating techniques. It does **not** include the engineering and construction of full-scale accelerators for any of the four types at this time. Applications to develop a full-scale accelerator are out of the scope of this Announcement and will be declined without review. Applications to develop longer-term compact accelerator technologies (e.g., plasma wakefield accelerators, laser-driven accelerators, two-beam accelerators, THz accelerators) will be declined if submitted to Track 1. Eligible applicants may submit such applications to Track 2.

To meet the teaming requirement, applications under this Track 1 topic area **are strongly encouraged to** include significant participation from **all three** of the following: (1) an institution with technical leadership in a relevant accelerator technology, (2) an institution with technical experience in applying accelerator technology to the security and/or medical application proposed, and (3) a domestic company currently marketing closely related security and/or

medical technology. Applications lacking significant participation in any of these three areas may score poorly under merit review.

References

As background, workshops were conducted to identify the accelerator technology research directions with the potential for high impact on security and medical applications. Workshops relevant to this topic area include:

- *Basic Research Needs Workshop on Compact Accelerators for Security and Medicine*, Edited by Mike Fazio, Jeff Buchsbaum, and Suresh Pillai, (2019).
https://science.osti.gov/-/media/hep/pdf/Reports/2020/CASM_WorkshopReport.pdf.
- *Accelerators for America's Future*, Edited by Walter Henning and Charles Shank, (2009).
<https://science.osti.gov/~media/hep/pdf/accelerator-rd-stewardship/Report.pdf>.

Track 2: Long-Term Generic Accelerator R&D

Technical Contact: Eric Colby, 301-903-5475, Eric.Colby@science.doe.gov

NOTE: Track 2 has restricted eligibility: only regionally accredited U.S. institutions of higher education or domestic non-profit organizations subject to section 501 (c)(3) of the Internal Revenue Code of 1986 may apply.

Long-term generic accelerator R&D is basic research¹⁰ aimed at improving the theory, computational tools, and fundamental physical and technical understanding of accelerator science. Note that more restrictive eligibility requirements apply to this topic—see [Section III.A](#) for further information. Applications may include the involvement of either an individual PI or a collaborative team. Teams are expected to develop a single research application.

Advancements in basic accelerator science and technology enable new capabilities in virtually every area of accelerator application. Applications are sought for high-impact advances in the following general areas: beam physics, advanced computational methods for accelerator design and analysis, advanced data-science techniques (e.g., AI/ML¹¹) for accelerator controls, beam diagnostics and feedback control, new superconducting materials, new materials and coatings for accelerator components, novel power sources for accelerators, new particle sources, novel magnet designs, novel lattice designs, compact accelerator technologies, and novel technologies for secondary beam production.

Applications that will lead to significant increases in performance (flux, brightness, polarization, coherence, stability, reliability, flexibility) and decreases in cost (construction cost, operating cost, physical size, complexity) are sought.

While R&D in this area is often far upstream of application, the areas where the research will have greatest impact can generally be identified. *It is essential that the applications clearly articulate how the R&D meets a stated need of the Stewardship Customer.* See the detailed merit

¹⁰ Specifically, it is basic research that is not intended for a specific facility or construction project.

¹¹ “AI/ML” refers to artificial intelligence and machine learning techniques.

review questions in [Section V.A.2](#) under “Quality of the Accelerator Stewardship or Accelerator Development Opportunity”, and the selection considerations in [Section V.B.3](#) “Selection”.

During both pre-application and full application reviews, the stakeholder federal agencies will be contacted to confirm that the work is a priority (see [Section V.B.2](#)) and is not duplicative of existing efforts. Applications which are not encouraged by one or more of the stakeholder federal agencies will not be funded.

Track 3: Accelerator Stewardship Test Facility Program

Technical Contact: Eric Colby, 301-903-5475, Eric.Colby@science.doe.gov

Awards made under this Track provide assistance to non-DOE entities seeking to make short-term use of the accelerator R&D capabilities available at the DOE SC National Laboratories that are not otherwise available as SC User Facilities.

A wide array of test stands and facilities for microwave, laser, magnet, superconducting RF, and particle beam testing exist, along with specialized expertise in high-accuracy accelerator modeling, engineering, fabrication and measurement.

SC accelerator R&D capabilities may be found by browsing the following participating DOE National Laboratories’ webpages:

- Argonne National Laboratory: <https://www.anl.gov/aai/capabilities>
- Brookhaven National Laboratory: <https://www.bnl.gov/partner/>
- Fermi National Accelerator Laboratory: <https://iarc.fnal.gov/>
- Lawrence Berkeley National Laboratory: <https://atap.lbl.gov/>
- Oak Ridge National Laboratory: <https://neutrons.ornl.gov/rad>
- SLAC National Accelerator Laboratory: <https://www6.slac.stanford.edu/research/accelerators-and-society>
- Thomas Jefferson National Accelerator Facility: <https://www.jlab.org/accelerator>

The intent of Track 3 awards is to enable non-DOE entities to gain access to and use these unique capabilities for **short-term engagements**. Track 3 awards may be up to 12 months in duration and are **not renewable**. There must be a distinct achievement at the end of the performance period which on its own justifies the resources being requested. Long-term R&D challenges requiring more than 12 months to address should not be submitted to Track 3. If the proposed work scope will not fit within 12 months, consider applying to Track 2 (if eligible).

The non-DOE entity must clearly “own” the work and be the principal beneficiary of the outcome. Applications may not be structured such that the DOE lab is the prime beneficiary of the work. Such applications cannot be selected for financial assistance awards. Further information about the program intent and goals may be found at <https://science.osti.gov/ardap/ARDAP-Programs/Research-and-Development/Accelerator-Stewardship/Test-Facility-Pilot-Program>.

Applicants **must work closely** with an SC National Laboratory (the “Host Lab”) when preparing

the application to ensure the compatibility of the work with the Lab’s mission and capabilities, the availability of the resource, and an accurate budget. A **collaborative application** must be filed, with the lead application originating from the non-DOE entity, and a collaborative application being submitted by the Host Lab.

Activities must meet the following requirements:

1. The activity must be research & development only.
2. The R&D must be non-proprietary, and the results must be published.
3. The activity must involve an accelerator R&D facility or core competence at the Host Lab. The activity **must not request funds to use an SC User Facility**, as access to these Facilities is already provided at no cost to non-proprietary users.
4. The work scope must be for short-term use of a facility or capability and must complete within the project period, which is limited to 12 months and **is not renewable**. Work requiring multiple years to complete should not be proposed through Track 3.
5. The activity must meet the requirements of DOE Order 481.1E Chg. 1 “Strategic Partnership Projects”, in particular, section 4(c)¹²:
 - a. the activity must be consistent with or complementary to the mission of the DOE laboratory and the facility at which the work will occur,
 - b. the activity must not adversely impact other programs assigned to the facility,
 - c. the activity must not place the facility in direct competition with the domestic private sector, and
 - d. the activity must not create a detrimental future burden on DOE resources.
6. The provisions of DOE Order 522.1A “Pricing of Departmental Materials and Services”¹³ must be followed if funds are requested to cover the Host Lab’s incremental cost of operating the facility.

Awards are intended for the *utilization of existing* accelerator R&D capabilities for a specific basic R&D purpose. Applications that focus primarily on upgrading a DOE capability will be declined without review.

Applications that do not include a collaborative application submission from the Host Lab will be declined without review.

Applicants are advised that requests for capabilities will be reviewed by the specific SC program that is the steward of the capability. Resources that are critical to the operation of a National User Facility may not be approved for use.

Accelerator Development

The central goal of Accelerator Development is to increase supply chain resiliency for accelerator technology by:

- engaging the expertise and facilities of the domestic accelerator R&D ecosystem in a manner that enhances knowledge and technology transfer; and

¹² <https://www.directives.doe.gov/news/0481.1e-new>

¹³ <https://www.directives.doe.gov/news/new-doe-o-522.1a-pricing-of-departmental-materials>

- strengthening the accelerator technology capabilities of U.S. industry, with a focus on strengthening production capability.

Track 4: Accelerator-Technology Sector Production Enhancement

Technical Contact: Eric Colby, 301-903-5475, Eric.Colby@science.doe.gov

ARDAP was established in 2020 in recognition of the central importance of accelerators and related technologies to the current and future scientific capabilities stewarded by SC programs. One of the objectives of ARDAP is to provide technology advances and enhance the domestic industrial strength that will position the U.S. to lead the world for years to come. Specifically in this Track, ARDAP intends to support domestic vendors for key AS&T technologies to address potential supply chain vulnerabilities that would add risk to new, upgraded, and operating accelerator facilities over the next 10-20 years.

The following five accelerator technology sectors are strategically important for current and future accelerator facilities:

1. Advances in superconducting accelerator systems, including superconducting radiofrequency (SRF), superconducting magnets, and cryogenic engineering.
2. Beam physics and high-fidelity computer modeling, better diagnostics, artificial intelligence/machine learning (AI/ML)-based control systems, advanced focusing and beam cooling techniques.
3. Advances in high intensity electron, proton, and ion sources, megawatt-class targets for secondary particle sources.
4. Higher-average-power and higher-efficiency radiofrequency (RF) and ultrafast laser sources, power handling devices, high-precision/accuracy x-ray optics.
5. High-risk, high-reward advances in particle sources, beam dynamics, acceleration techniques, and materials.

ARDAP plans to make investments to facilitate development of stronger production capabilities in key technology sectors. Track 4 funds both planning and execution of Accelerator Development activities. Track 4a supports the development of Strategic Accelerator Technology Sector Business Plans. Track 4b supports accelerator development activities that will lead to reduced supply chain risks for critical accelerator technology needed by DOE, the broader Government, and domestic companies that depend on accelerator technology.

(a) Track 4a: Accelerator Technology Sector Business Plans

Track 4a applications are sought to support basic research that will result in the development of coherent, comprehensive, quantitative business plans that synergistically leverage the complementary strengths of industry, the National Laboratories, and academia, and will result in a domestic accelerator technology ecosystem that can support physical science for years to come. Track 4a awards may be up to 12 months in duration and are not renewable. Teaming requirements apply to this track, see below.

With a view of new, upgraded, and operating U.S. accelerator facilities over the next 10 years, what is a feasible business approach for a partnership to developing enhanced domestic

production capabilities that can meet the anticipated production delivery requirements of one of the technology sectors listed above? The research must produce a report containing a business plan that has, at a minimum, the following:

- a. A description of the optimal partnership including:
 - i. a discussion of the group of public and private institutions that should be directly involved in the partnership;
 - ii. a discussion of which technologies would need to be transferred from both DOE National Laboratories and universities to this partnership;
 - iii. a discussion of how an optimal partnership's management structure could work;
 - iv. a discussion of how best to affect the transfer of technology from both DOE National Laboratories and universities to this partnership;
 - v. a discussion of where public funding would be needed to draw strong participants into the partnership and overcome existing market failures;
 - vi. a discussion of how quality can be assured across the partnership of companies; and
 - vii. a description of how intellectual property is managed.
- b. An analysis of the pathway to production at market scale.
- c. An analysis and projection of the market for this technology sector, discussing the optimal route to making the industry (or partnership) sustainable, and considering possible synergies with related technologies and markets.
- d. Description of what workforce development is needed to ensure the long-term success of this technology sector.
- e. Discussion of other critical factors, not listed above, that would impact the viability of the eventual industry or partnership (e.g., regulatory issues).

There are currently teams working to understand the superconducting wire, cable, and high-field magnet sector, the radiofrequency power generation sector, and aspects of normal-conducting accelerator cavity manufacturing. Additional applications to study these sectors will be discouraged.

Specifics of the partnership need to be defined in the report, including what entities (domestic companies, DOE National Laboratories, and/or universities) constitute it. Discussion of where existing and future market pull is likely to support industrial production, and where public funding is needed to overcome market entry costs is essential. Successful applications will clearly differentiate technologies that will have significant leverage from market demand and industrial interest from those that require significant long-term federal investment. Awardees will communicate with ARDAP during the award to identify future accelerator production needs.

To meet the teaming requirement, applications under this Track 4a topic area **are strongly encouraged to** include significant participation from each of the following: (1) at least one institution with technical leadership in one of the accelerator technology sectors listed above, (2) multiple industrial companies currently active (or interested in becoming active) in this sector of the marketplace, and (3) a business school or business consulting firm with experience developing business plans in AS&T or in a technologically and economically similar marketplace. Applications lacking significant participation in any of these three areas may score

poorly under merit review (see [Section V.A.2](#)).

The final report must be the result of a broad, inclusive engagement with performers in the specific technology sector and should fairly reflect the challenges and situation of the market sector as a whole. While the approach needed to reach this level of broad understanding will differ for each technology sector, successful proposals to-date have taken a two-step approach, engaging the relevant communities through preparatory work (e.g., one-on-one meetings, interviews, surveys, other market research) followed by a meeting or workshop at which synthesis of the inputs resulted in the identification of broadly applicable challenges and possible mitigations.

Specifically not of interest are: (1) single-technology or single-vendor commercialization plans, and (2) R&D applications seeking to perform technology transfer. Applications of either type are unresponsive and will be declined without review.

Note that the final product will be a publicly available business plan describing the analyses listed above.

(b) Track 4b: Accelerator Technology Partnerships

Track 4b applications are sought for accelerator development that will result in strengthened domestic industrial capability and supply chain risk reduction. Of the five accelerator technology sectors listed above (comprising 23 distinct subtopic areas), applications are sought only in the areas of:

- 1) Manufacturing of superconducting wire, cable, and high field magnets.
- 2) Manufacturing of high intensity sources of electrons.
- 3) Manufacturing of high intensity sources of ions.
- 4) Manufacturing of targets for producing secondary beams.
- 5) Manufacturing of high-efficiency radiofrequency power sources.
- 6) Manufacturing of high-accuracy x-ray optics.

Applications in other technology sectors or subtopics are not sought at this time and will be deemed unresponsive.

Successful applications will synergistically leverage the complementary strengths of industry and the national laboratories and will result in a domestic ecosystem for accelerator technology that can support physical sciences research for years to come. Track 4b awards may be up to 24 months in duration and are renewable. Teaming requirements apply to this track, see below.

While the U.S. continues to excel in discovery and innovation, the accelerator development necessary to convert new emerging technologies into products remains a challenge for individual companies, leading to accelerator technology supply chain vulnerabilities. ARDAP looks to turn

U.S.-based accelerator inventions into products made by a skilled American workforce¹⁴, as well as adapting certain foreign accelerator advances to domestic products.

A successful project in this Track will lead to an enhanced U.S. production capability of one or multiple key accelerator technologies needed for new, upgraded, and operating SC accelerator facilities over the next 10 years and provide technologies that support industrial applications of accelerators in medicine, clean energy, environmental, security, and industry.

ARDAP envisions this will be achieved through formal partnership between DOE National Laboratories and industry with elements of (1) technology transfer from the laboratories to industry, (2) continued maintenance and advanced R&D at the laboratories, and (3) production development in industry. Applicants are encouraged to consider innovative approaches.

Partnership models best suited for different accelerator technology areas may be very different in their nature. Potential elements of the partnership should be chosen to best address supply chain risks in full view of the current market conditions and the unique capabilities of the public and private sectors. Possible elements of a partnership include:

- Collaborative R&D involving public and private sector partners to jointly develop technology and manufacturing know-how;
- Formation of a “center” or “institute” that serves as the center-of-mass for an extended collaboration of public and private sector participants;
- Design for Manufacturing, including industrial engineering to reduce risk and cost in the manufacturing process and making optimal use of advanced manufacturing techniques.
- Industry use of laboratory facilities;
- Vendor development and qualification through fabrication of components of increasing quality and complexity;
- Providing government furnished equipment to industry;
- Engaging in long-term purchasing contracts; *and*
- Developing strategic reserves of especially critical materials, components, or subsystems.

While the focus is on national laboratories and industry, university partners can be added if appropriate for the selected accelerator technology area.

Ideally, the partnership allows each partner to collaboratively engage in pre-competitive development of the technology. A successful project will lead to an equitable sharing of developed intellectual property (IP) between the Government and industry. Federally-owned IP will be available to all domestic industrial entities, even those outside the partnership (although entities that are in the partnership would likely develop a significant competitive advantage due to their own investments in the technology development, and synergies from those investments, if any).

¹⁴ Consistent with Executive Order 14005, “Ensuring the Future Is Made in All of America by All of America’s Workers”, January 25, 2021. <https://www.federalregister.gov/d/2021-02038>

The application must address the following questions:

- i. What is the current state of domestic production of this technology? What domestic companies produce technology in this area, and how and why does the market not meet future SC accelerator facility needs?
- ii. What domestic capability will be established or enhanced and which future SC accelerator facility project(s) will this capability impact?
- iii. What will be the relationship between the DOE National Laboratory(ies) and industry?
- iv. What part of the capability remains at the DOE National Laboratory(ies) and what part resides in the industrial partner(s)?
- v. How does the management structure work?
- vi. How is technology transferred funded and managed?
- vii. How is IP handled?
- viii. How will this capability become sustainable (i.e., will it need continued long-term Federal funding or will the direct or indirect market be large enough to maintain the capability)?
- ix. How does this partnership preserve future domestic competition in this topical area?
- x. What workforce will be needed and how will it be developed?
- xi. Are there other critical factors, not listed above, that would impact the viability of the eventual industry or partnership (e.g., regulatory issues), and how would they be addressed?

Projects may have a two-year renewal cycle, contingent on final project reviews that will ensure the Federal investment in the partnership structure is appropriate. Metrics for the renewal decision will include (1) impact on future accelerator projects, (2) ability for the developed capability to be sustainable (and the level of long-term Federal investment, if any), (3) equitable Federal ownership of developed IP, and (4) maintaining a fair playing field for newcomers in the domestic industry.

To meet the teaming requirement, applications under this Track 4b topic area need to include balanced participation of one or more DOE National Laboratory and multiple industrial companies currently active (or interested in becoming active) in this sector of the marketplace. Applications lacking significant participation from either of these sectors may score poorly under merit review (see [Section V.A.2](#)).

Successful applications have directly addressed the (1) application of the proposed research, (2) had strong industrial partnership, and (3) surveyed other domestic competition in the technology area and identified how healthy domestic competition will be maintained.

Specifically not of interest are applications: (1) of a purely academic nature, (2) that lack appropriate industrial partners, and (3) that would lead to a decrease in market competitiveness (i.e., only one vendor is strengthened in a market that has multiple domestic vendors). Applications of these types are unresponsive and will be declined without review.

Annual Meetings

PIs should plan on travelling to the Washington, DC area for a two- to three-day annual PI meeting, beginning in FY2023. Reasonable travel expenses may be included in the proposed budget.

Teaming Arrangements

Collaborative teams (in which each team member submits its own application with a common research narrative) are strongly encouraged. Merit reviewers are asked to specifically score the strength of the collaborative team (see [Section V.A.2](#) for more information). Note carefully that the type of application required depends on the Track.

For Track 1, Track 2, and Track 4, team efforts involving different institutions must be submitted as follows:

A single application from the institution of the Lead PI, if successful, the collaboration will be funded through a single award to the lead institution, with sub-awards to collaborators as necessary and appropriate.

Multi-institutional teams must submit one application from a designated lead institution with all other team members proposed as subrecipients.

DOE/National Nuclear Security Administration (NNSA) National Laboratories¹⁵, other Federal agencies, and another Federal agency's FFRDCs¹⁶, if participating in a team led by another institution, must be proposed as subrecipients.

Note: The value of any such proposed subaward may be removed from any such prime award. DOE may make separate awards to Federally affiliated institutions.

For Track 3, team efforts must include both a non-DOE entity and a DOE SC Host Laboratory, and a *Collaborative Application must be submitted, with the non-DOE entity designated as the lead institution.*

Teams of multiple institutions must submit collaborative applications. Each submitted application in such a team must indicate that it is part of a collaborative project/group. Every partner institution must submit an application through its own sponsored research office. Each multi-institutional team can have only one lead institution. Each application within the multi-institutional team, including the narrative, starting with the title page, and all required appendices and attachments, must be identical with the following exceptions:

¹⁵ The phrase “National Laboratories” is used broadly to encompass DOE/NNSA laboratories and sites capable of performing the work described in this FOA and capable of receiving funds through the DOE Field Work System.

¹⁶ An authoritative list of all Federally Funded Research and Development Centers (FFRDCs) may be found at <https://www.nsf.gov/statistics/ffrdelist/>.

- Each application must contain a correct SF-424 (R&R)¹⁷ cover page for the submitting institution only.
- Each application must contain a unique budget corresponding to the expenditures for that application’s submitting institution only.
- Each application must contain a unique budget justification corresponding to the expenditures for that application’s submitting institution only.

Our intent is to create from the various applications associated with a multi-institutional team one document for merit review that consists of the common, identical materials combined with a set of detailed budgets from the partner institutions. Thus, it is very important that every research narrative in the multi-institutional team be identical, while each team member must submit its own system-generated cover page, budget, and budget justification. Each team member’s application must contain the same project title.

Open Science

SC is dedicated to promoting the values of openness in Federally supported scientific research, including, but not limited to, ensuring that research may be reproduced and that the results of Federally supported research are made available to other researchers. These objectives may be met through any number of mechanisms including, but not limited to, data access plans, data sharing agreements, the use of archives and repositories, and the use of various licensing schemes.

The use of the phrase “open-source” does not refer to any particular licensing arrangement but is to be understood as encompassing any arrangement that furthers the objective of openness.

Guidance for Application Budgets and Costs

All costs requested in a budget must adhere to standard requirements for all Federal awards:

- Costs must be reasonable, using a prudent-person standard. (2 CFR 200.404),
- Costs must be allocable, related to the particular Federal award. (2 CFR 200.405),
- Costs must be allowable under the relevant Federal cost principles. (See 2 CFR 200.420 and following),
- Costs must be consistently treated, whether they are paid for with Federal funds or institutional funds. (2 CFR 200.403(c)),

Allowable costs include:

- “Buying out” faculty time dedicated to teaching or administrative responsibilities,
- Support for administrative personnel dedicated to the proposed activity,
- Support for professional development, training, mentoring of students and junior researchers,

¹⁷ The Standard Form 424 (SF-424) family of forms is used to apply for Federal financial assistance through <https://www.Grants.gov>. The Research and Related (R&R) set of forms is used by the Office of Science.

- Travel to meet with collaborators at other institutions and relevant DOE/NNSA national laboratories, including costs for internships at the national laboratories; or to attend one or more science team, user facility, scientific conference, workshop, or professional society meetings relevant to the proposed research; or for the conduct of off-site research,
- Fringe benefits, which must be paid in accordance with an institution's negotiated rates agreement, institutional policies, and the individual's appointment,
- Temporary dependent-care costs incurred during travel,
- Membership costs in relevant professional societies, including both scientific societies and those dedicated to research administration,
- Instrumentation required to conduct proposed research,
- Equipment (items with a useful life of more than 12 months and a per-item acquisition cost of more than \$5,000) required to conduct proposed research,
- Purchase of equipment, modification of equipment, provide services necessary to enable work to be carried out by project personnel with a disability,
- Stipends and benefits for students and post-doctoral researchers, recognizing their dual nature as both trainees and employees,
- Salary support to cover time to participate in outreach for recruitment, internships, and training events, science team meetings, partnership development, or information gathering, and
- Other direct costs, e.g., materials and supplies such as office supplies, desktop or laptop computer, and/or software licenses that are directly necessary to enable the proposed activities.

All entities submitting applications to this FOA must recognize the moral and legal obligations to comply with export controls and policies that limit the transfer of technologies with potential dual use. Applicants are reminded that international activities must comply with nonproliferation, sanction, and other protocols described at <https://www.export.gov>.

International activities related to special nuclear materials (SNM) are subject to additional requirements. Please see 10 CFR 810 for further information.

This FOA is to support scientific endeavors that could be described in scholarly publications. Do not submit applications containing restricted data or unclassified controlled nuclear information as defined in the Atomic Energy Act of 1954, as amended, 42 USC 2011, et seq., 10 CFR 1017, 10 CFR 1045.

Section II – AWARD INFORMATION

A. TYPE OF AWARD INSTRUMENT

DOE anticipates awarding grants, interagency agreements, and National Laboratory authorizations under this FOA.

Multi-institutional teams applying under Tracks 1, 2, 4a, or 4b must apply using a prime and subaward model with one application submitted by the lead institution. Track 3 applications must be submitted as Collaborative Applications.

Statement of Substantial Involvement

Not applicable.

B. ESTIMATED FUNDING

DOE anticipates that, subject to the availability of future year appropriations, approximately \$19,500,000 will be available for all Accelerator Stewardship and Accelerator Development new and renewal awards.

Out of an estimated \$10,000,000 in FY 2023 funding: approximately \$2,000,000 may be awarded in the Track 2 topic area of Long-Term Generic Accelerator R&D; approximately \$600,000 may be awarded in the Track 3 topic area of Accelerator Stewardship Test Facility Program; approximately \$600,000 may be awarded in the Track 4a topic area of Accelerator Technology Sector Business Plans; approximately \$4,000,000 may be awarded in the Track 4b topic area of Accelerator Technology Partnerships; and the remainder of funds may be allocated to Track 1 Accelerator Stewardship Topical Areas. These divisions are provided for planning and estimating purposes only and do not reflect a commitment of how funds will be distributed.

DOE anticipates that the total value of grants made under this FOA will be approximately \$9.5 million, and an additional \$10 million will support National Laboratory authorizations and interagency awards.

DOE is under no obligation to pay for any costs associated with preparation or submission of applications. DOE reserves the right to fund, in whole or in part, any, all, or none of the applications submitted in response to this FOA.

C. MAXIMUM AND MINIMUM AWARD SIZE

(See [B. Estimated Funding](#) above.)

The award size will depend on the number of meritorious applications and the availability of appropriated funds.

Track 1 and Track 2: Maximum award size \$3,000,000 (except for design studies, which are

limited to \$200,000). Minimum award size \$75,000.

Note: The ceiling and floor given above for Track 1 and Track 2 applications represent historical experience. Past practice is not an obligation to stay within the historic ceiling and floor.

Track 3: Maximum award size \$300,000. Minimum award size \$75,000.

Track 4a: Maximum award size \$200,000. Minimum award size \$50,000.

Track 4b: Maximum award size \$2,000,000. Minimum award size \$250,000.

Applications requesting more or less than the relevant maximum or minimum award size may be declined without further review.

D. EXPECTED NUMBER OF AWARDS

(See [B. Estimated Funding](#) above.)

The exact number of awards will depend on the number of meritorious applications and the availability of appropriated funds.

E. ANTICIPATED AWARD SIZE

(See [B. Estimated Funding](#) above.)

The award size will depend on the number of meritorious applications and the availability of appropriated funds.

F. PERIOD OF PERFORMANCE

(See [B. Estimated Funding](#) above.)

The period of performance will depend on the number of meritorious applications, the results of merit review, the program policy factors, and the availability of appropriated funds.

Track 3 applications must not have a period of performance that is longer than 12 months.

Track 4a applications must not have a period of performance that is longer than 12 months.

Track 4b applications must not have a period of performance that is longer than 24 months.

Continuation funding (funding for the second and subsequent budget periods) is contingent on: (1) availability of funds appropriated by Congress and future year budget authority; (2) progress towards meeting the objectives of the approved application; (3) submission of required reports; and (4) compliance with the terms and conditions of the award.

G. TYPE OF APPLICATION

DOE will accept new and renewal applications under this FOA, subject to the following restrictions:

Renewal Applications are accepted for Track 1 and Track 2 **only**. Renewal applications submitted to Tracks 3, 4a, and 4b¹⁸ may be declined without review.

Information about how to distinguish between new and renewal applications is located in [Section VIII](#).

National Laboratories requesting additional support and time for an existing activity must include a list of all publications and products resulting from the existing activity in Appendix 7 to the Research Narrative.

¹⁸ Track 4b is excluded from renewal applications in the FY 2023 cycle because no awards are up for renewal. Starting with the FY2024 cycle, renewals will be accepted.

Section III – ELIGIBILITY INFORMATION

A. ELIGIBLE APPLICANTS

All types of domestic applicants are eligible to apply, except nonprofit organizations described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995.

In accordance with 2 CFR 910.126, Competition, eligibility for award is restricted to:

Track 1: Accelerator Stewardship Topical Areas

Applications for activities in Track 1: Accelerator Stewardship Topical Areas will be accepted from all responsible domestic organizations capable of meeting the objectives of this FOA.

Track 2: Long-Term Generic Accelerator R&D

Applications for activities in Track 2: Long-Term Generic Accelerator R&D will only be accepted from regionally-accredited U.S. academic institutions or domestic non-profit organizations subject to section 501 (c)(3) of the Internal Revenue Code of 1986.

Track 3: Accelerator Stewardship Test Facility Program

Applications for activities in Track 3: Accelerator Stewardship Test Facility Program will be accepted from all responsible domestic organizations capable of meeting the objectives of this FOA, with the exception of DOE National Laboratories which cannot be the lead institution on a Track 3 application. Partnering DOE National Laboratories must submit their collaborative application to Grants.gov.

Track 4: Accelerator-Technology Sector Production Enhancement

Applications for activities in Track 4a and 4b: Accelerator-Technology Sector Production Enhancement will be accepted from all responsible domestic organizations capable of meeting the objectives of this FOA.

Eligibility is limited in Track 2 to regionally-accredited domestic institutions of higher education and non-profit organizations. The tools of accelerator science are maintained by domestic institutions of higher education and non-profit organizations, and the leadership and expertise in conducting research in accelerator science and engineering have been demonstrated to reside at domestic institutions of higher education and non-profit organizations.

Federally affiliated¹⁹ entities must adhere to the eligibility standards below:

1. DOE/NNSA National Laboratories

DOE/NNSA National Laboratories are eligible to submit applications under this FOA and may be proposed as subrecipients under another organization's application. If recommended for funding as a lead applicant, funding will be provided through the DOE Field-Work Proposal System and work will be conducted under the laboratory's contract with DOE. No administrative provisions of this FOA will apply to the laboratory or any laboratory subcontractor. If recommended for funding as a proposed subrecipient, the value of the proposed subaward will be removed from the prime applicant's award and will be provided to the laboratory through the DOE Field-Work Proposal System and work will be conducted under the laboratory's contract with DOE. Additional instructions for securing authorization from the cognizant Contracting Officer are found in [Section VIII](#) of this FOA.

2. Non-DOE/NNSA FFRDCs

Non-DOE/NNSA FFRDCs are eligible to submit applications (either as a lead organization or as a team member in a multi-institutional team) under this FOA and may be proposed as subrecipients under another organization's application. If recommended for funding as a lead applicant, funding will be provided through an interagency agreement Award to the FFRDC's sponsoring Federal Agency. If recommended for funding as a proposed subrecipient, the value of the proposed subaward may be removed from the prime applicant's award and may be provided through an Inter-Agency Award to the FFRDC's sponsoring Federal Agency. Additional instructions for securing authorization from the cognizant Contracting Officer are found in [Section VIII](#) of this FOA.

3. Other Federal Agencies

Other Federal Agencies are eligible to submit applications under this FOA and may be proposed as subrecipients under another organization's application. If recommended for funding as a lead applicant, funding will be provided through an interagency agreement. If recommended for funding as a proposed subrecipient, the value of the proposed subaward may be removed from the prime applicant's award and may be provided through an interagency agreement. Additional instructions for providing statutory authorization are found in [Section VIII](#) of this FOA.

Notes for applicants of all types:

This FOA does not support an applicant's commercial activity. This FOA seeks to support basic research to advance understanding rather than to address commercial opportunities. Applications that propose research related to current commercial activity or current customer needs may be declined without merit review. All for-profit applicants must include a description,

¹⁹ Institutions that are not DOE/NNSA National Laboratories, a non-DOE/NNSA FFRDC, or another Federal agency are not Federally affiliated, even if they receive Federal funds or perform work under a Federal award or contract.

not to exceed 200 words, of how their proposed work will advance scientific understanding of a basic and fundamental nature as an appendix to the research narrative.

Applications that are submitted by applicants that have not submitted a required pre-application may be declined without further review.

Applicants may propose non-domestic entities as subrecipients in their applications, provided no domestic entity is capable of performing the work.

B. COST SHARING

Cost sharing for basic and fundamental research is not required pursuant to an exclusion from the requirements of Section 988 of the Energy Policy Act of 2005.

Cost sharing is not required of DOE/NNSA National Laboratories, other Federal agencies, another Federal agency's FFRDC, or their subcontractors at any tier. DOE/NNSA National Laboratories, other Federal agencies, and another Federal agency's FFRDC may impose cost-sharing requirements on their contractors subject to their policies and procedures.

Demonstrations of institutional or third-party commitment to the proposed activity are **strongly encouraged** for all applications.

Examples of non-Federal contributions that may be considered as demonstrating institutional or third-party commitment include, but are not limited to, the following:

- The provision of space, facilities, equipment, or resources at no or reduced charge.
- The provision of release time for faculty.
- The provision of scholarship support for students.
- The waiver of facilities and administrative costs, in whole or in part; or
- Third party contributions (e.g., state, private entities, etc.).

Contributions must originate from a non-federally-funded source. Equipment, effort, or facilities whose acquisition or operation was or is funded by a federal source cannot be included as institutional commitments.

The institutional commitment is not to be documented on the application's budget forms: institutional commitments are neither a formal nor a voluntary committed cost sharing, but it must be described in the application narrative, with supporting letters provided in Appendix 6 as appropriate.

Institutional commitments may not include the following:

- revenues or royalties from the prospective operation of an activity beyond the time considered in the award;
- proceeds from the prospective sale of an asset of an activity; or
- other Federal awards.

Additionally, cost sharing may be required under a class patent waiver, if applicable, as

discussed in [Section VIII](#).

Cost sharing is not required of DOE/NNSA National Laboratories, other Federal agencies, another Federal agency's FFRDC, or their subcontractors at any tier. DOE/NNSA National Laboratories, other Federal agencies, and another Federal agency's FFRDC may impose cost-sharing requirements on their contractors subject to their policies and procedures.

C. ELIGIBLE INDIVIDUALS

Individuals with the skills, knowledge, and resources necessary to carry out the proposed research as a Principal Investigator (PI) are invited to work with their organizations to develop an application. Individuals from underrepresented groups as well as individuals with disabilities are always encouraged to apply.

D. LIMITATIONS ON SUBMISSIONS

Applicant institutions are limited to no more than two (2) pre-applications, or applications for each PI at the applicant institution. DOE will consider the latest received submissions to be the institution's intended submissions.

- Pre-applications in excess of the limited number of submissions may be discouraged.
- Applications in excess of the limited number of submissions may be declined without review.

The PI on a pre-application, or application may also be listed as a senior or key personnel on separate submissions without limitation.

Section IV – APPLICATION AND SUBMISSION INFORMATION

A. ADDRESS TO REQUEST APPLICATION PACKAGE

Application forms and instructions are available at Grants.gov. To access these materials, go to <https://www.Grants.gov>, select “Search Grants”, and then enter the Catalog of Federal Domestic Assistance (CFDA) number (81.049) and/or the FOA number shown on the cover of this FOA. Select the “Apply” button to access the application package.

Applications submitted through www.FedConnect.net will not be accepted. Applications may not be submitted through PAMS at <https://pamspublic.science.energy.gov>.

B. LETTER OF INTENT (LOI) AND PRE-APPLICATION

1. Letter of Intent (LOI)

Not applicable.

2. Pre-application

PRE-APPLICATION DUE DATE

The pre-application due date is printed on the cover of the FOA.

ENCOURAGE/DISCOURAGE DATE

The pre-application response date is printed on the cover of the FOA.

A pre-application is required and must be submitted by the date indicated on the cover of the FOA.

Pre-applications will be reviewed for responsiveness of the proposed work to the research topics identified in this FOA. DOE will send a response by email to each applicant encouraging or discouraging the submission of an application by the date indicated on the cover of the FOA. Applicants who have not received a response regarding the status of their pre-application by this date are responsible for contacting the program to confirm this status.

Track 3 Applicants only:

All team members including the lead institution should submit a pre-application.

Applications that have not been encouraged by DOE may be declined without merit review.

The pre-application must include, at the top of the first page, the following information:

Title of Pre-application
Principal Investigator Name, Job Title
Institution
PI Phone Number, PI Email Address
FOA Number: Include the FOA Number indicated on the cover of this FOA
Application Type: [New or Renewal]
Track # / Topic #

This information must be followed by a clear and concise description of the objectives and technical approach of the proposed research.

Proposed Research: What will be accomplished? What methods will be used? Why is the approach superior to existing approaches?

Stewardship or Development Customer: Who, specifically, is the stakeholder for this work? What specific evidence is there that the proposed work addresses a priority need of the stakeholder?

Statement of Work: At a high level, what are the main tasks to be accomplished?

Description of results, products: What scientific and/or technical advances will result? How will the results be a significant advance over existing knowledge or techniques? How will the results be captured (scientific papers, prototypes, patents, software packages, etc.)?

Teaming and Management Plan: With whom do you plan to team? What unique advantages does your group or team have? How do the group/team participants reflect the range of skills needed to complete the proposed research? How will the effort be managed?

Cost, Schedule, and Milestones: Provide a high-level description of the cost, schedule, and major milestones of the proposed work. A summary table, similar to the example below, is required:

Institution	Task Lead	Main Tasks & Milestones	Yr 1 [k\$]	Yr 2 [k\$]	Yr 3 [k\$]
University X	R. Doe	Complete design simulations of widget. Simulation support during testing.	30	10	10
	S. Jones	Engineer and build widget.	170	120	10
Laboratory Y	T. Smith	Consult during design phase. Test prototype widget at test facility Q.	10	50	120
Company Z	U. Brown	Consult during design phase. Design initial marketable version of widget.	20	50	130
Total			230	230	270

The pre-application may not exceed two pages, when printed using standard letter-size (8.5 inch x 11 inch) paper with 1-inch margins (top, bottom, left, and right). The font must not be smaller than 11 point. Figures and references, if included, must fit within the two-page limit.

In addition, a listing of individuals who should not serve as merit reviewers of a subsequent application must be provided *as an Excel spreadsheet sent via email* by the pre-application deadline to Eric.Colby@science.doe.gov. Detailed instructions for how to craft such a listing are provided in [Section VIII](#) of this FOA. *This list should not be included in the PDF file with the pre-application and it does not count toward the pre-application's two-page limit. A pre-application that does not include the listing of conflicted individuals may receive a "discourage" response.*

The pre-application must be machine-readable. Do not submit a scanned image of a printed document.

PRE-APPLICATION REVIEW

Those pre-applications that are encouraged will be used to help SC begin planning for the application peer review process. SC's intent in discouraging submission of certain applications is to save the time and effort of applicants in preparing and submitting applications not responsive to this FOA.

The PI will be automatically notified when the pre-application is encouraged or discouraged. The DOE SC Portfolio Analysis and Management System (PAMS) will send an email to the PI from PAMS.Autoreply@science.doe.gov, and the status of the pre-application will be updated at the PAMS website <https://pamspublic.science.energy.gov/>. Notifications are sent as soon as the decisions to encourage or discourage are finalized.

PRE-APPLICATION SUBMISSION

Pre-applications are created in the software system of your choice and must be submitted electronically through the DOE SC Portfolio Analysis and Management System (PAMS) website <https://pamspublic.science.energy.gov/>. You cannot draft or edit a pre-application in PAMS.

Pre-applications may be submitted by a PI or by other users at the PI's institution with the "Submit to DOE" privilege in PAMS.

Applicants are strongly encouraged to inform their DOE Program Manager if teaming arrangements, proposed personnel, topics, or the anticipated title change between submitting the pre-application and when an application is submitted, to ensure that their application is properly linked to their pre-application and that reviewers are properly assigned to the proposal.

Detailed instructions about how to submit a pre-application are in [Section VIII](#) of this FOA.

C. GRANTS.GOV APPLICATION SUBMISSION AND RECEIPT PROCEDURES

Applications in response to this FOA must be submitted through Grants.gov. Detailed instructions for registering in and using Grants.gov are in [Section VIII](#) of this FOA.

D. CONTENT AND APPLICATION FORMS

LETTERS

Letters of commitment from collaborators or institutions providing access to equipment and/or facilities may be appended to your research narrative and are not considered part of the research narrative's page limit. Please ensure that letters from collaborators or from institutions providing access to equipment and/or facilities only describe the nature of the collaboration or the access to equipment and/or facilities.

Letters of support or recommendation are not allowed in applications under this FOA.

1. SF-424 (R&R)

Complete this form first to populate data in other forms. Complete all the required fields in accordance with the pop-up instructions on the form. The list of certifications and assurances referenced in Field 17 is available on the DOE Financial Assistance Forms Page at <https://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms> under Certifications and Assurances. Applicants are bound by their representations and certifications in SAM.gov.

UEI AND EIN NUMBERS (FIELDS 5 AND 6)

The UEI and Employer Identification Number (EIN) fields on the SF-424 (R&R) form are used in PAMS to confirm the identity of the individual or organization submitting an application.

- Enter the UEI as a 12-digit alpha-numerical sequence
- Enter the EIN as a nine-digit number.
- Do not use hyphens or dashes.
- SC does not use the 12-digit EIN format required by some other agencies.

TYPE OF APPLICATION (FIELD 8)

A **new** application is one in which DOE support for the proposed research is being requested for the first time. A **renewal** application requests additional funding for a period of time following a current award. If the application requests a significant change in the scope of work, please consult with the Program contact identified in this FOA to determine if the application should be considered new or a renewal.

SC does not make use of the Resubmission or Continuation options.

Applications for supplemental support of an existing award should be marked as "Revision."

Please answer "yes" to the question "Is this application being submitted to other agencies?" if substantially similar, identical, or closely related research objectives are being submitted to another Federal agency. Indicate the agency or agencies to which the similar objectives have been submitted.

Do not attach pre-applications to Field 21 of the SF-424(R&R) form or letters of intent to Field 21 of the SF-424(R&R) form. Doing so will render your application unreadable.

2. Research and Related Other Project Information

Complete questions in fields 1 through 6 of the SF-424 Research and Related Other Project Information form.

Note regarding question 4.a. and 4.b.:

If any environmental impact, positive or negative, is anticipated, indicate “yes” in response to question 4.a., “potential impact – positive or negative - on the environment.” Disclosure of the impact should be provided in response to question 4.b. First indicate whether the impact is positive or negative and then identify the area of concern (e.g., air, water, exposure to radiation, etc.). Should the applicant have any uncertainty, they should check “yes.”

DOE understands the phrase in field 4.a., “potential impact ... negative” to apply if the work described in the application could potentially have any of the impacts listed in (1) through (5) of 10 CFR 1021, Appendix B, Conditions that Are Integral Elements of the Classes of Action in Appendix B. (<https://www.ecfr.gov>)

Additionally, for actions which could have any other adverse impacts to the environment or have any possibility for adverse impacts to human health (e.g., use of human subjects, Biosafety Level 3-4 laboratory construction/operation, manufacture or use of certain nanoscale materials which are known to impact human health, or any activities involving transuranic or high level radioactive waste, or use of or exposure to any radioactive materials beyond de minimis levels), applicants should indicate a “negative” impact on the environment.

Lastly, 1) if there would be extraordinary circumstances (i.e., scientific or public controversy) related to the significance of environmental effects (10 CFR 1021.410 (b)(2)), 2) if the work is connected to other actions with potentially significant impacts (10 CFR 1021.410 (b)(3)), or 3) if the work is related to other nearby actions with the potential for cumulatively significant impacts (10 CFR 1021.410 (b)(3)), applicants should indicate a “negative” impact on the environment.

The bulk of your application will consist of files attached to the Research and Related Other Project Information form. The files must comply with the following instructions:

PROJECT SUMMARY/ABSTRACT (FIELD 7 ON THE FORM)

The project summary/abstract is a summary of the proposed activity suitable for distribution to the public and sufficient to permit potential reviewers to identify conflicts of interest. It must be a self-contained document. The project summary/abstract must be comprised of

- A cover sheet containing the name of the applicant, the project title, the PI and the PI’s institutional affiliation, and any coinvestigators and their institutional affiliations.
- This information must be followed by a summary of the objectives of the project, a description of the project, including methods to be employed, and the potential impact of the project (i.e., benefits, outcomes).
- The description of the proposed research may not exceed one page when printed using standard letter-size (8.5 inch x 11 inch) paper with 1-inch margins (top, bottom, left, and right). The font must not be smaller than 11 point. Figures and references, if included, must fit within the one-page limit.

A sample is provided below:

<p>Project Title</p> <p>A. Smith, Lead Institution (Principal Investigator) A. Brown, Institution 2 (Co-Investigator) A. Jones, Institution 3 (Co-Investigator)</p> <p>Text of abstract</p>

The project summary must not exceed one page when printed using standard letter-size (8.5 inch x 11 inch) paper with 1-inch margins (top, bottom, left and right) with font not smaller than 11 point. To attach a Project Summary/Abstract, click “Add Attachment.”

If an application is recommended for award, the project summary will be used in preparing a public abstract about the award. Award abstracts and titles form a Government document that describes the project and justifies the expenditure of Federal funds in light of the DOE and SC mission statements at <https://energy.gov/mission> and <https://science.osti.gov/about/>.

- Do not include any proprietary or sensitive business information.
- DOE may use the abstract to prepare public reports about supported research.

DOE TITLE PAGE

(PART OF PROJECT NARRATIVE ATTACHED TO FIELD 8 ON THE FORM)

The application narrative must begin with a title page that will not count toward the project narrative page limitation. The title page must include the following items:

- The project title
- Applicant/Institution:
- Street Address/City/State/ZIP:
- Postal Address:
- Lead PI name, telephone number, email:
- Administrative Point of Contact name, telephone number, email:
- FOA Number: Include the FOA number printed on the cover of this FOA.
- DOE/SC Program Office: Accelerator R&D and Production
- DOE/SC Program Office Technical Contact: Eric Colby

- DOE Award Number (if Renewal Application):
- PAMS Preproposal tracking number:
- Research area as identified in [Section I](#) of this FOA:
- Include a table modeled on the following chart providing summary budget information from all collaborating institutions. Provide the total costs of the budget request in each year for each institution and totals for all rows and columns. Include the value of any institutional commitment being offered. If necessary, modify the table below for the correct number of years.

Name and Yearly Budget for Applications with Multiple Institutions							
	Name	Institution	Year 1 Budget	Year 2 Budget	Year 3 Budget	Total Budget	Institutional Commitment
Lead PI							
Co-PI							
Co-PI							
Co-PI							

SAMPLE BUDGET TABLE

Important Instructions to the Sponsored Research Office of Submitting Institutions: SC requires that you create one single machine-readable PDF file that contains the DOE Title Page, project narrative, all required appendices, and other attachments. This single PDF file may not be scanned from a printed document and must be attached in Field 8 on the Grants.gov form. This must be a plain PDF file consisting of text, numbers, and images without editable fields, signatures, passwords, redactions, or other advanced features available in some PDF-compatible software. Do not use PDF portfolios or binders. The research narrative will be read by SC staff using the full version of Adobe Acrobat: Please ensure that the narrative is readable in Acrobat. If combining multiple files into one research narrative, ensure that a PDF portfolio or binder is not created. If creating PDF files using any software other than Adobe Acrobat, please use a “Print to PDF” or equivalent process to ensure that all content is visible in the research narrative. Once a research narrative has been assembled, please submit the combined research narrative file through a “Print to PDF” or equivalent process to ensure that all content is visible in one PDF file that can be viewed in Adobe Acrobat. Do not attach any of the appendices listed in this paragraph separately in any other field in Grants.gov. If you do, these additional attachments will not become part of the application in PAMS.

TITLE PAGE SUPPLEMENT FOR TRACK 3 COLLABORATIVE APPLICATIONS
(PART OF PROJECT NARRATIVE ATTACHED TO FIELD 8 ON THE FORM)

If a multi-institutional team is submitting collaborative applications, provide the following information on a separate page as a supplement to the title page. This page will not count toward the project narrative page limitation.

- List all institutions by name with each institution’s PI on the same line.
- Indicate the lead PI who will be the point of contact and coordinator for the combined research activity.
- Provide a statement explaining the leadership structure of the team.
- Include a description of each institution’s facilities, equipment, and resources that will be made available to the team.
- If applicable, explain how students and early-stage researchers will be trained and mentored by senior researchers.
- Include a table modeled on the following chart providing summary budget information from all institutions. Provide the total costs of the budget request in each year for each institution and totals for all rows and columns.

	Names	Institution	Year 1 Budget	Total Budget	Institutional Commitment
Lead PI					
Co-PI					
Co-PI					
Co-PI					

Example budget table (\$ in thousands)

* Note that collaborating applications must be submitted separately.

PROJECT NARRATIVE (FIELD 8 ON THE FORM)

The Project Narrative **must not exceed the page limits given in the table below**, including technical information, including charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard letter-size (8.5 inch x 11 inch) paper with 1-inch margins (top, bottom, left, and right). The font must not be smaller than 11 point.

Track	Narrative Page Limit
Track 1	16 pages
Track 2	16 pages
Track 3	5 pages
Track 4a	6 pages
Track 4b	18 pages

Merit reviewers will only consider the number of pages specified in the table above. This page limit does not apply to the Title Page, Budget Page(s), Budget Justification, biographical material, publications and references, and appendices, each of which may have its own page limit defined later in this FOA.

Do not include any websites (URLs) that provide supplementary or additional information that constitutes a part of the application. Merit reviewers are not required to access websites; however, Internet publications in a list of references will be treated identically to print

publications. See [Section VIII](#) for instructions on how to mark proprietary application information. To attach a Project Narrative, click “Add Attachment.”

Buy America Requirement for Infrastructure Projects

Awards funded through this FOA that are for, or contain, construction, alteration, maintenance, or repair of public infrastructure in the United States undertaken by applicable recipient types, require that:

- All iron, steel, and manufactured products used in the infrastructure project are produced in the United States; and
- All construction materials used in the infrastructure project are manufactured in the United States.

Applicants should consult [Section VIII](#) of this FOA to determine whether the Buy America Requirement applies and if they should consider the application of the Buy America Requirement in the proposed project’s budget and/or schedule.

Within the first 2 pages of the Project Narrative, include a short statement on whether the project will involve the construction, alteration, maintenance and/or repair of public infrastructure in the United States. See [Section VIII](#) for applicable definitions and other information regarding Infrastructure Projects and the Buy America Requirement.

The Project Narrative is considered the intellectual work of the proposed researchers. Concurrent submission of the same or substantially similar narratives attributed to different researchers may constitute academic dishonesty or research misconduct. Submission of a research narrative that is not the work of the proposed researchers, including machine-generated research narratives, may constitute academic dishonesty or research misconduct.

The narrative required depends on the Track to which the grant application is being submitted. Read this section carefully to understand the appropriate format and content to include.

Narrative Format for Track 1: Accelerator Stewardship Topical Areas

Track 1 applications must not exceed **16 pages** and must include the following sections, with a recommended page length for each section indicated in braces:

A. {1 page} Background/Introduction. Explanation of the importance and relevance of the proposed work as well as a review of the relevant literature. A brief description of research activities conducted by the primary team members and their R&D groups, including accomplishments and impacts made during the recent past (typically the past three years), is also encouraged.

B. {6 pages} Proposed Research, Innovative Claims, Technical Rationale, and Approach. If appropriate, identify the hypotheses to be tested and details of the methods to be used. This section should describe the scientific and technical challenges, unique approach(es), and potential anticipated technical solutions in the topical area that will be

addressed. Applications should clearly explain the technical approach(es) that will be employed and provide ample justification for their feasibility. This section should demonstrate that the applicant has a clear understanding of the state-of-the-art, and it should provide sufficient technical details to permit complete evaluation of the feasibility of the approach. Additionally, comparison with other ongoing research efforts should be provided indicating advantages and disadvantages of the proposed effort.

C. {2 pages} Program Plan & Risk Assessment. A narrative explaining the explicit timelines, milestone achievements, and quantitative metrics by which progress toward the goals can be evaluated. The proposed period of performance of the overall program, and each program phase, should be clearly stated. The narrative should include a specific plan detailing how all program metrics will be accurately assessed. This section should also identify major technical risk elements specific to the proposed approach, estimate the risk magnitude for each such element, and describe specific plans to mitigate risk.

D. {1 page} Statement of Work. Clearly and concisely define the technical work to be performed on a task-by-task basis, listing the durations and the dependencies among the tasks. The statement of work **must** include a table defining the program metrics to be applied.

For each task, provide the following:

- A general description of its objective.
- A detailed description of the approach to be taken to accomplish the objective.
- Identification of the primary organization responsible for task execution (prime, sub, team member, by name, etc.).
- The completion criteria for each task/activity – a product, event, or milestone that defines its completion.

E. {2 pages} Description of the Results, Products, Transferable Technology, and Expected Technology Transfer Path. Summarize the objectives associated with the proposed research and, where appropriate, the plans and capability to accomplish technology transfer and commercialization. If this application has a commercial product as the end goal, clearly describe the market opportunity. If intellectual property rights will be reserved and assigned, describe the expected assignment of such rights, the measures to be used to protect proprietary information, and include relevant agreements in Appendix 6. See also [Section VIII](#) for instructions on marking proprietary information in the application.

F. {2 pages} Teaming and Management Plan. A clearly defined organization chart for the program team that includes, as applicable: (1) the programmatic relationship of the primary team member; (2) the unique capabilities of the primary team members; (3) the task responsibilities of the primary team members; (4) the teaming strategy among the team members; and (5) the key personnel along with the amount of effort to be expended by each person during each year. Please include in Appendix 6: Other Attachment any formal teaming agreements that are required to execute this plan. It is strongly recommended to have each named member of the collaboration (PIs, Co-Is, and Senior Key/Personnel) verify that their PAMS information is up to date.

G. {2 pages} Cost, Schedule, and Measurable Milestones for the Proposed research, including estimates of cost for each task in each year of the effort, broken down by the primes and major subcontractors, total cost, and any voluntary cost sharing. (Note: Measurable milestones should capture key development points in tasks and should be clearly articulated and defined in time relative to start of effort.) Where the effort consists of multiple portions which could reasonably be partitioned for purposes of funding, these should be identified as options with separate cost estimates for each. Describe the institutional commitment being offered (see [Section III.B](#)).

Narrative Format for Track 2: Long-Term Generic Accelerator R&D

Track 2 applications must not exceed **16 pages** and must include the following sections:

Background/Introduction: Explanation of the importance and relevance of the proposed work as well as a review of the relevant literature. Describe the application(s) that are most likely to be impacted by this work, citing prior workshops, studies, white papers, or other documented evidence of the need for progress in this application area†. A brief description of research activities conducted by the Principal Investigator and his/her group, including specific roles and responsibilities in collaborative research efforts, and accomplishments and impacts made during the recent past (typically the past three years), is also encouraged.

Multiple Investigators: In applications with more than one senior investigator, the accomplishments, milestones, and plans of each senior investigator must be clearly identified. Reviewers will be asked to assess the accomplishments and plans of each senior investigator and these evaluations will be used as input to the funding decisions. It is strongly recommended to have each named member of the collaboration (PIs, Co-Is, and Senior Key/Personnel) verify that their PAMS information is up to date.

Proposed Research and Methods: Identify the hypotheses to be tested (if any) and details of the methods to be used.

Project Objectives: This section should provide a clear, concise statement of the specific objectives/aims of the proposed project.

Timetable of Activities: This section should outline, year-by-year, all the important activities or phases of the project, including any activities planned beyond the project period. Successful applicants must use this project timetable to report progress.

Narrative Format for Track 3: Accelerator Stewardship Test Facility Program

Track 3 awards are considerably shorter in duration and smaller in scope, and consequently

† Please note that applications are scored on how well the proposed work meets the needs of one or more Stewardship Customers. See [Section V.A.2](#) for a definition of the term “Stewardship Customer”, and for examples of what constitutes evidence of customer interest.

have an abbreviated application format. Track 3 applications must not exceed five (5) pages and must include the following sections, with a recommended page length for each section indicated in braces:

A. {0.5 page} Background/Introduction. Explanation of the importance and relevance of the proposed work as well as a review of the relevant literature. A brief description of research activities conducted by the primary team members and their R&D groups, including accomplishments and impacts made during the recent past (typically the past three years), is also encouraged.

B. {1.5 pages} Proposed Research, Innovative Claims, Technical Rationale, and Approach. If appropriate, identify the hypotheses to be tested and details of the methods to be used. This section should describe the scientific and technical challenges, unique approach(es), and potential anticipated technical solutions in the topical area that will be addressed. Applications should clearly explain the technical approach(es) that will be employed and provide ample justification for their feasibility. This section should demonstrate that the applicant has a clear understanding of the state-of-the-art, and it should provide sufficient technical details to permit complete evaluation of the feasibility of the approach. Additionally, comparison with other ongoing research efforts should be provided indicating advantages and disadvantages of the proposed effort.

C. {1 page} Statement of Work. Clearly and concisely define the technical work to be performed on a task-by-task basis, listing the durations and the dependencies among the tasks. This section must clearly define the role of the requested National Laboratory capabilities. Details about the specific National Laboratory facilities and expertise required should be included in Appendix 2 and an explanation of the requested costs to use these capabilities should be provided in the Budget Justification.

For each task, provide the following:

- A general description of its objective.
- A detailed description of the approach to be taken to accomplish the objective.
- Identification of the primary organization responsible for task execution (prime, sub, team member, by name, etc.).
- The completion criteria for each task/activity – a product, event, or milestone that defines its completion.

D. {1 page} Description of the Results, Products, Transferable Technology, and Expected Technology Transfer Path. Summary of objectives associated with the proposed research and, where appropriate, the plans and capability to accomplish technology transfer and commercialization. If this application has a commercial product as the end goal, clearly describe the market opportunity. If intellectual property rights will be reserved and assigned, describe the expected assignment of such rights, the measures to be used to protect proprietary information, and include relevant agreements in Appendix 6: Other Attachments.

E. {1 page} Cost, Schedule, and Measurable Milestones for the Proposed Research, including estimates of cost for each task in each year of the effort, broken down by the

primes and major subcontractors, total cost, and any voluntary cost sharing. (Note: Measurable milestones should capture key development points in tasks and should be clearly articulated and defined in time relative to start of effort.) Describe the institutional commitment being offered (see [Section III.B](#)).

For Collaborative Track 3 Applications Only: Each institution in a multi-institutional team submitting collaborative applications must submit an identical common narrative, including all appendices. The common narrative must identify which tasks and activities will be performed by which of the institutions in every budget period of the proposed project. The budget and the budget justification—which are unique to each institution—may refer to parts of the common narrative to further identify each institution’s activities in the joint project. There should be no ambiguity about each institution’s role and participation in the team.

SC will use the multiple applications associated with a multi-institutional team to create one consolidated document for merit review that consists of the common, identical application materials combined with a set of detailed budgets from the partner institutions. It is very important that every application in the team be identical (including the title) with the exception of the budget and budget justification pages.

Narrative Format for Track 4a: Accelerator-Technology Sector Production Enhancement Business Plans

Track 4a awards are considerably shorter in duration and smaller in scope, and consequently have an abbreviated application format. Track 4a applications must not exceed six **(6) pages** and must include the following sections, with a recommended page length for each section indicated in braces:

A. {1 page} Background/Introduction. Explanation of the importance and relevance of the proposed technology sector as well as a review of the relevant literature. Provide a brief description of the current market state and the state of any public-private collaborations and partnerships that exist in this sector. Outline the research and industrialization activities conducted by the primary team members participating in this application, including accomplishments and impacts made during the recent past (typically the past three years).

B. {1 page} Outline of the Business Plan. This section should provide an overview of the business plan that the collaboration expects to prepare. The questions identified under the Track 4a topic description above are the minimum requirements, but are neither comprehensive, nor sufficient to comprise a complete business plan. Describe the additional questions and discussion that are needed to provide a complete business plan.

C. {2 pages} Proposed Information Gathering and Analysis. This section should describe the approach to gathering the required information to inform the development of the business plan. This section should describe the sources and methods, outline any meetings or other public input processes, and outline the analysis that will be completed.

D. {0.5 page} Statement of Work. Clearly and concisely define the work to be performed on a task-by-task basis, listing the durations and the dependencies among the tasks. This section must identify all key tasks and identify the contributions of the different team members for each of these tasks.

For each task, provide the following:

- A general description of its objective.
- A detailed description of the approach to be taken to accomplish the objective.
- Identification of the primary organization responsible for task execution (prime, sub, team member, by name, etc.).
- The completion criteria for each task/activity – a product, event, or milestone that defines its completion.

E. {1 page} Teaming and Management Plan. A clearly defined organization chart for the program team that includes, as applicable: (1) the programmatic relationship of the primary team members; (2) the unique capabilities of the primary team members; (3) the task responsibilities of the primary team members; (4) the teaming strategy among the team members; and (5) the key personnel along with the amount of effort to be expended by each person. Please include in Appendix 6: Other Attachment any formal teaming agreements that are required to execute this plan.

F. {0.5 page} Cost, Schedule, and Measurable Milestones for Developing the Business Plan, including estimates of cost for each task of the effort, broken down by the primes and major subcontractors, total cost, and any voluntary cost sharing. (Note: Measurable milestones should capture key development points in tasks and should be clearly articulated and defined in time relative to start of effort.) Describe the institutional commitment being offered (see [Section III.B](#)).

Narrative Format for Track 4b: Accelerator Technology Partnerships

Track 4b applications must not exceed **18 pages** and must include the following sections, with a recommended page length for each section indicated in braces:

A. {2 pages} Background/Introduction. Explanation of the importance and relevance of the proposed partnership. This section should summarize the:

- key accelerator technology topical area addressed by this proposed partnership;
- motivation of the proposed partnership;
- formation and organization of the partnership;
- partnership's potential impact in terms of increased domestic manufacturing capability in this topical area;
- relevant accelerator technology market, identifying domestic suppliers
- partnership will stay sustainable, and estimate the duration and amount of targeted Federal funding (if any) required for the capability to stay sustainable; and
- technical innovations (if any) that would be needed to facilitate this partnership.

B. {4 pages} Identification of a Technology Production Challenge with Substantive National Impact. Establishes the context for the application by describing the specific high-risk and/or high-impact supply chain vulnerability targeted and describing how the proposed partnership will address that problem. This section should include a description of the:

- current domestic production capability of the identified accelerator technology;
- US accelerator facility needs for this technology, possible or likely shortfalls, and impact of these shortfalls;
- market, listing all relevant companies, their capabilities, and why specifically they are unlikely to meet the technology need without government assistance;
- current economic barriers to maintaining the needed domestic capability;
- technical breakthroughs that would help support the needed domestic capability;
- resultant mitigation of supply chain vulnerability for SC accelerator facilities and the broader U.S. manufacturing markets.

C. {8 pages} Program Plan. This section should include the following two subsections.

1. *Business Plan* {5 pages}

The business plan (similar to that asked for in Track 4a) should include:

- i. A description of the optimal partnership including:
 1. which public and private institutions that should be directly involved in the partnership;
 2. which technologies would need to be transferred from both DOE National Laboratories and universities to this partnership;
 3. what part of the technology capability resides in the partner national laboratory(ies) and what part resides in the partner industrial entity(ies);
 4. how an optimal partnership's management structure could work;
 5. how best to affect the transfer of technology from both DOE National Laboratories and universities to this partnership;
 6. where public funding would be needed to draw strong participants into the partnership and overcome existing market failures;
 7. how quality can be assured across the partnership of companies; and
 8. how intellectual property is managed.
- ii. A description of the pathway to production at market scale.
- iii. A description and projection of the market for this technology sector, discussing the optimal route to making the industry (or partnership) sustainable, and considering possible synergies with related technologies and markets.
- iv. A description of what workforce development is needed to ensure the long-term success of this technology sector.
- v. A description of domestic industrial non-partnership members can share in the pre-competitive development of the technology.
- vi. Discussion of other critical factors, not listed above, that would impact the viability of the eventual industry or partnership (e.g., regulatory issues).

2. *Technical Approach and Work Plan* {3 pages}

This section describes the technical approach the application team will take to meet the project goals and objectives identified by the business plan. It includes a work plan that clearly identifies the key project steps and associated tasks that will be required to complete the proposed project and who is responsible for each task. The tasks should be described in terms of their specific objectives, approaches, and outcomes. The description of the specific tasks should be detailed enough so that the work plan can be clearly evaluated as to whether there is a credible plan for moving the technology from the current stage of development to the next. Describe expected results that will be achieved, if successful, and where and how the proposed solution will be tested and validated. Specify deliverables, including experimental data, components, workforce development strategy, materials and design, techno-economic analysis, design specification, reports, etc., as appropriate. Identify the deliverables and milestones and how they fit into multiple renewals of this project. Applicants should articulate how their technology approach for addressing the barriers and knowledge gaps will successfully motivate the industry investments that will be required to complete technology development and facilitate deployment of these technologies across the U.S. manufacturing ecosystem. An assessment of the starting domestic TRL/MRL of the technology/process and a prediction of the domestic TRL/MRL status upon completion of the project should be included in this section.

D. {2 pages} Management Plan. The management plan should include the following:

- The programmatic relationship of the primary partnership members.
- The unique capabilities of the primary partnership members.
- The task responsibilities of the primary partnership members.
- The teaming strategy among the partnership members.
- The key personnel along with the amount of effort to be expended by each person during each year.
- A Risk Abatement Plan (see notes below).
- The partnership intellectual property (IP) plan.
- Facilities and infrastructure leveraged for this partnership.
- How the partnership funding is split between Federal and industrial cost sharing.
- If there is foreign participation, how it adds value to the partnership and does not compromise the domestic production competitiveness.

Notes on Risk Abatement Plan

The Risk Abatement Plan should identify all risks associated with the project. It should include the following elements:

- Task Linkage: Identify which task/sub-task is at risk;
- Risk: Describe the risk as a negative statement;
- Type of Risk: Characterized the nature of the risk according to whether it is a cost, technical, schedule risk, or market risk;
- Probability/Impact: Assign a score (H=3, M=2, L=1) to both the probability and the impact;
- Risk Score: Calculated by multiplying the probability and impact scores; and
- Abatement Plan: Describe the steps that will be taken to abate the risk.

E. {2 pages} Cost, Schedule, and Measurable Milestones. This should include estimates of cost for each task in each year of the effort, broken down by the primes and major subcontractors, total cost, and any voluntary cost sharing. The schedule should be in the form of a Gantt chart or similar tool that describes the tasks, milestones, and timeline for the project. The start and end date for each major task and subtask should be defined in terms of months from Project Start. If a 6-month task is schedule to begin month one (designated M1), the start and end dates would M1 and M6. (Note: Measurable milestones should capture key development points in tasks and should be clearly articulated and defined in time relative to start of effort.) Where the effort consists of multiple portions which could reasonably be partitioned for purposes of funding, these should be identified as options with separate cost estimates for each. Describe all institutional commitments being offered (see [Section III.B](#)).

General Instructions That Apply to All Applications

It is important that the project narrative section provide a complete description of the proposed work, because reviewers are not obliged to read the last Appendix in any detail. Applications exceeding the page limits will be declined without review. The page count limitation does not include the Cover Page and Budget Pages, the Title Page, the biographical material and publication information, or any Appendices.

Do not attach any of the requested appendices described below as files for fields 9, 10, 11, and 12 in Grants.gov. Follow the below instructions to include the information as appendices in the single, bundled project narrative file.

Biographical sketches and current and pending support may no longer be provided as attachments to a research narrative. These documents must be attached to the Research and Related Senior/Key Person Profile (Expanded) form in an application.

APPENDIX 1: BIBLIOGRAPHY & REFERENCES CITED

Provide a bibliography of any references cited in the Project Narrative. Each reference must include the names of all authors (in the same sequence in which they appear in the publication), the article and journal title, book title, volume number, page numbers, and year of publication. For research areas where there are routinely more than 10 coauthors of archival publications, you may use an abbreviated style such as the *Physical Review Letters* (PRL) convention for citations (listing only the first author). For example, your paper may be listed as, “A Really Important New Result,” A. Aardvark et. al. (MONGO Collaboration), PRL 999. Include only bibliographic citations. Applicants should be especially careful to follow scholarly practices in providing citations for source materials relied upon when preparing any section of the application. Provide the Bibliography and References Cited information as an appendix to your project narrative.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 2: FACILITIES & OTHER RESOURCES

This information is used to assess the capability of the organizational resources, including subrecipient resources, available to perform the effort proposed. Identify the facilities to be used (Laboratory, Animal, Computer, Office, Clinical and Other). If appropriate, indicate their capacities, pertinent capabilities, relative proximity, and extent of availability to the project. Describe only those resources that are directly applicable to the proposed work. Describe other resources available to the project (e.g., machine shop, electronic shop) and the extent to which they would be available to the project. For proposed investigations requiring access to experimental user facilities maintained by institutions other than the applicant, please provide a document from the facility manager confirming that the researchers will have access to the facility. Such documents, provided that they do not become letters of support or recommendation, may be printed on any letterhead. Please provide the Facility and Other Resource information as an appendix to your project narrative.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 3: EQUIPMENT

List major items of equipment already available for this project and, if appropriate identify location and pertinent capabilities. Provide the Equipment information as an appendix to your project narrative.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 4: DATA MANAGEMENT PLAN

Provide a Data Management Plan (DMP) as an appendix to the research narrative.

- This appendix should not exceed a page limit of 2 pages including charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard letter-size (8.5 inch x 11 inch) paper with 1-inch margins (top, bottom, left, and right)
- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

The standard requirements for a DMP may be found in [Section VIII](#) of this FOA.

APPENDIX 5: PROMOTING INCLUSIVE AND EQUITABLE RESEARCH (PIER) PLAN

All new and renewal applications that are not for conference support must provide a Promoting Inclusive and Equitable Research (PIER) Plan as an appendix to the research narrative. The PIER plan should describe the activities and strategies of the applicant to promote equity and inclusion as an intrinsic element to advancing scientific excellence in the research project within the context of the proposing institution and any associated research group(s). Plans may include, but are not limited to: strategies of your institution (and collaborating institutions, if applicable) for enhanced recruitment of undergraduate students, graduate students, and early-stage investigators (postdoctoral researchers, and others), including individuals from diverse backgrounds and groups historically underrepresented in the research community; strategies for

creating and sustaining a positive, inclusive, safe, and professional research and training environment that fosters a sense of belonging among all research personnel; and/or training, mentoring, and professional development opportunities.²⁰ Plans may incorporate or build upon existing diversity, equity, accessibility, and inclusion efforts of the project key personnel or applicant institution(s), but should not be a re-statement of standard institutional policies or broad principles. The complexity and detail of a PIER is expected to increase with the size of the research team and the number of personnel to be supported.

- Do not attach a separate file.
- This appendix should not exceed a page limit of 3 pages when printed using standard letter-size (8.5 inch x 11 inch) paper with 1-inch margins (top, bottom, left, and right) This appendix will not count in the project narrative page limitation

APPENDIX 6: OTHER ATTACHMENT

If you need to elaborate on your responses to questions 1-6 on the “Other Project Information” document, please provide the Other Attachment information as an appendix to your project narrative. Information not easily accessible to a reviewer may be included in this appendix, but do not use this appendix to circumvent the page limitations of the application. Reviewers are not required to consider information in this appendix.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 7: DOE/NNSA NATIONAL LABORATORY “RENEWALS” OF ONGOING ACTIVITY

If a DOE/NNSA National Laboratory submits an application that seeks to extend the performance of current work being done at the Laboratory, provide a detailed listing of all publications and other products derived from the current work. The listing may be provided in any scholarly bibliographic format.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

REMINDERS REGARDING ALL APPENDICES

- **Follow the above instructions to include the information as appendices to the project narrative file.**
- **These appendices will not count toward the project narrative’s page limitation.**
- **Do not attach any appendices to fields 9, 10, 11, or 12.**

3. Research and Related Senior/Key Person Profile (Expanded)

Complete the Research and Related Senior/Key Person Profile (Expanded) form in accordance with the instructions on the form and the following instructions. Complete this form before the Budget form to populate data on the Budget form.

²⁰ Please see additional information at <https://science.osti.gov/SW-DEI/DOE-Diversity-Equity-and-Inclusion-Policies/Q-and-As#definitions>.

You must submit this information for the PI and all senior/key personnel who will be identified by name in Section A of the application's budget. List all other personnel who contribute in a substantive, meaningful way to the scientific development or execution of the project, whether or not salaries are requested. Consultants should be included in this "Senior/Key Person Profile (Expanded)" Form if they meet this definition. List individuals that meet the definition of senior/key regardless of what organization they work for. Senior/key personnel must be aware that they are included in the application and must agree to perform the work if awarded. The form will pre-populate with the PI identified on the SF-424(R&R) form. For each senior/key person:

- Complete the required sections in their profile
- In the "credential" field, enter the person's PAMS username, if known
- Attach the person's biographical sketch, following in instructions in [Section VIII](#) for crafting a biographical sketch.
- Attach the person's current and pending support, following the instructions in [Section VIII](#) for crafting current and pending support.

The Senior/Key Person Profile (Expanded) form will support the PI and up to 99 additional senior/key personnel. On the addition of the 99th senior/key person, you will be presented with an option to upload an additional file with the required information for all other senior/key personnel.

4. Research And Related Budget

Complete the Research and Related Budget form in accordance with the instructions on the form (Activate Help Mode to see instructions) and the following instructions. You must complete a separate budget for each year of support requested. The form will generate a cumulative budget for the total project period. You must complete all the mandatory information on the form before the NEXT PERIOD button is activated. You may request funds under any of the categories listed as long as the item and amount are necessary to perform the proposed work, meet all the criteria for allowability under the applicable Federal cost principles, and are not prohibited by the funding restrictions in this FOA.

Additional information is found in [Section VIII](#) of this FOA.

BUDGET JUSTIFICATION (FIELD L ON THE FORM)

Provide a justification that explains all costs proposed in the budget. The following items of advice are offered to assist you in developing a justification.

- Organize the justification by listing items in the same order as presented on the budget.
- Ensure that the narrative matches the budget in dollar amounts and language.
- Explain the line items. If costs are estimated, provide a basis for the estimate. Explain if costs are based on prior experience of similar activities. If a cost is based on the product of two numbers (such as a number of items at a per-item price), ensure that your math is correct.
- If including an inflationary factor for future budget periods, explain the basis for the

inflationary factor.

Provide any other information you wish to submit to justify your budget request. Including items in the budget justification is not considered a form of cost-sharing: Provide the details of all personnel (key or other) who will be working on the award, regardless of their source(s) of compensation. Explain their source(s) of compensation if it is not from this award. Include the indirect cost rate agreement as a part of the budget justification.

Attach a single budget justification file for the entire project period in field L. The file automatically carries over to each budget year.

Additional information is found in [Section VIII](#) of this FOA.

5. R&R Subaward Budget Attachment(s) Form

Budgets for Subawards: You must provide a separate R&R budget and budget justification for each subrecipient. Download the R&R Budget Attachment from the R&R SUBAWARD BUDGET ATTACHMENT(S) FORM and either email it to each subrecipient that is required to submit a separate budget or use the collaborative features of Workspace. After the subrecipient has either emailed its completed budget back to you or completed it within Workspace, attach it to one of the blocks provided on the form. Use up to 10 letters of the subrecipient's name (plus.pdf) as the file name (e.g., ucla.pdf or energyres.pdf). Filenames must not exceed 50 characters.

If the project involves more subrecipients than there are places in the SUBAWARD BUDGET ATTACHMENT(S) FORM, the additional subaward budgets may be saved as PDF files and appended to the Budget Justification attached to Field L.

Applicants should consult their local information technology ("IT") support resources for any necessary assistance in converting the forms downloaded from Grants.gov into plain PDF files that can be combined into one non-Portfolio PDF file (the Budget Justification).

Ensure that any files received from subrecipients are the PDF files extracted from the SUBAWARD BUDGET ATTACHMENT(S) FORM. Errors will be created if a subrecipient sends a prime applicant a budget form that was not extracted from the application package.

Note: If an application proposes subawards to a DOE/NNSA National Laboratory, a Federal agency, or another Federal agency's FFRDC, the value of such proposed subawards may be deducted from any resulting award: Those classes of organizations may be paid directly by SC. However, the details of such proposed budgets are an essential for understanding and analyzing the proposed research.

If the budget for an application is comprised of discrete or separable projects or tasks, the SUBAWARD BUDGET ATTACHMENT(S) FORM allows you to identify a budget as belonging to either a "project" or a "subaward."

6. Project/Performance Site Location(s)

Indicate the primary site where the work will be performed. If a portion of the project will be performed at any other site(s), identify the site location(s) in the blocks provided.

Note that the Project/Performance Site Congressional District is entered in the format of the 2 digit state code followed by a dash and a 3 digit Congressional district code, for example VA-001. Hover over this field for additional instructions.

Use the Next Site button to expand the form to add additional Project/Performance Site Locations.

7. Disclosure of Lobbying Activities (SF-LLL)

If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the grant/cooperative agreement, you must complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying."

8. Identification of Merit Reviewer Conflicts

Provide a list of individuals who should not serve as merit reviewers of this application, following the instructions in [Section VIII](#) of this FOA. Attach this information to Field 12 of the Research and Related Other Project Information Form.

9. Summary of Required Forms/Files

Your application must include the following items:

Name of Document	Format	Attach to
SF 424 (R&R)	Form	N/A
RESEARCH AND RELATED Other Project Information	Form	N/A
Project Summary/Abstract	PDF	Field 7
Project Narrative, including required appendices	PDF	Field 8
Identification of Merit Review Conflicts	File	Field 12
RESEARCH & RELATED Senior/Key Person Profile (Expanded)	Form	N/A
RESEARCH & RELATED BUDGET	Form	N/A
Budget Justification	PDF	Field L
R&R SUBAWARD BUDGET ATTACHMENT(S) FORM (if applicable)	Form	N/A
Subaward Budget Justification (if applicable)	PDF	Field L of the subaward budget

PROJECT/PERFORMANCE SITE LOCATION(S)	Form	N/A
SF-LLL Disclosure of Lobbying Activities, if applicable	Form	N/A

E. SUBMISSIONS FROM SUCCESSFUL APPLICANTS

If selected for award, DOE reserves the right to request additional or clarifying information for any reason deemed necessary, including, but not limited to:

- Indirect cost information
- Other budget information
- Name and phone number of the Designated Responsible Employee for complying with national policies prohibiting discrimination (See 10 CFR 1040.5)
- Representation of Limited Rights Data and Restricted Software, if applicable
- Commitment Letter from Third Parties Contributing to Cost Sharing, if applicable
- Environmental Information

Applicants that are not institutions of higher education, that request indirect costs, and that do not already have an Indirect Cost Rate Agreement with their Cognizant Federal Agency or documentation of rates accepted for estimating purposes by DOE or another Federal agency, are advised to begin preparing an Indirect Cost Rate Proposal for submission, upon request, to the DOE contract specialist/grants management specialist who will evaluate your application if you are selected for award.

F. SUBMISSION DATES AND TIMES

1. Letter of Intent Due Date

Not applicable.

2. Pre-application Due Date

The pre-application due date is printed on the cover of this FOA.

You are encouraged to submit your pre-application well before the deadline. Pre-applications may be submitted at any time between the publication of this FOA and the stated deadline.

3. Application Due Date

The application due date is printed on the cover of this FOA.

You are encouraged to transmit your application well before the deadline. Applications may be submitted at any time between the publication of this FOA and the stated deadline.

4. Late Submissions

Delays in submitting pre-applications and applications may be unavoidable. DOE has accepted late submissions when applicants have been unable to make timely submissions because of widespread technological disruptions or significant natural disasters. DOE has made accommodations for incapacitating or life-threatening illnesses and for deaths of immediate family members. Other circumstances may or may not justify late submissions. Unacceptable justifications include the following:

- Failure to begin submission process early enough.
- Failure to provide sufficient time to complete the process.
- Failure to understand the submission process.
- Failure to understand the deadlines for submissions.
- Failure to satisfy prerequisite registrations.
- Unavailability of administrative personnel.

You are responsible for beginning the submission process in sufficient time to accommodate reasonably foreseeable incidents, contingencies, and disruptions.

Applicants must contact the Program Office/Manager listed in this FOA to discuss the option of a late submission. Contacting the Program Office/Manager after the deadline may reduce the likelihood that a request will be granted.

DOE notes that not all requests for late submission will be approved.

Section V - APPLICATION REVIEW INFORMATION

A. CRITERIA

1. Initial Review Criteria

Prior to a comprehensive merit evaluation, DOE will perform an initial review in accordance with 10 CFR 605.10(b) to determine that (1) the applicant is eligible for the award; (2) the information required by the FOA, including LOIs or pre-applications, has been submitted; (3) all mandatory requirements are satisfied; (4) the proposed project is responsive to the objectives of the FOA, and (5) the proposed project is not duplicative of programmatic work. Applications that fail to pass the initial review will not be forwarded for merit review and will be eliminated from further consideration.

2. Merit Review Criteria

Applications will be subjected to scientific merit review (peer review) and will be evaluated against the following criteria as found in 10 CFR 605.10 (d), the Office of Science Financial Assistance Program Rule.

- Scientific and/or Technical Merit of the Project;
- Appropriateness of the Proposed Method or Approach;
- Competency of Applicant's Personnel and Adequacy of Proposed Resources;
- Reasonableness and Appropriateness of the Proposed Budget; and
- Quality and Efficacy of the Promoting Inclusive and Equitable Research (PIER) Plan.

Merit reviewers will be asked to evaluate one additional criterion:

- Quality of the Accelerator Stewardship or Accelerator Development Opportunity.

The review criteria are listed in decreasing order of significance, though their importance is comparable.

Note that external peer reviewers are selected with regard to both their scientific expertise and the absence of conflict-of-interest issues. Both Federal and non-Federal reviewers may be used, and submission of an application constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

The questions below are provided to the merit reviewers to elaborate the criteria established by regulation:

SCIENTIFIC AND/OR TECHNICAL MERIT OF THE PROJECT

- For Track 1 and 2 applications:
 - What is the scientific and/or technical innovation of the proposed research?
 - How might the results of the proposed work impact the direction, progress, and thinking

- in relevant scientific fields of research?
 - What is the likelihood of achieving valuable results?
 - Does the proposed work have the potential to significantly impact the Stewardship use described by the PI?
 - How does the proposed work compare with other efforts in its field, both in terms of scientific and/or technical merit and originality?
- For Track 3 applications:
 - Does the non-DOE entity “own” the work? Who is “driving” this application? Who benefits the most if the work succeeds?
- For Track 4a applications:
 - How might the results of the proposed work impact industrialization of accelerator technology, including possible future federal research investments that could support future industrialization?
 - Will the resultant business plan credibly lead to long-term domestic industrial stability in this accelerator technology sector?
- For Track 4b applications:
 - Does the business plan describe a viable partnership?
 - How likely are the results of this partnership to lead to an enhanced domestic industrial production capability in a key critical accelerator technology area?
 - Will this approach credibly lead to long-term domestic industrial stability for this key critical accelerator technology area (with or without continued Federal maintenance funding)?
 - Will the partnership clearly preferentially enhance the domestic technical vendor capability relative to foreign competitors?
- **For all applications:**
 - Will the proposed work have an impact on SC accomplishing its scientific research mission?
 - Is the Data Management Plan suitable for the proposed work and to what extent does it support the dissemination of results?

APPROPRIATENESS OF THE PROPOSED METHOD OR APPROACH

- For Track 1 applications:
 - Does the plan clearly describe the current technology state, and the technical gaps that must be addressed, to realize the application?
 - Does the Program Plan and Risk Assessment correctly identify the primary risks, and appropriate mitigations for each?
 - If the application could result in a commercial product, has the market opportunity been clearly assessed and described? How good is the market opportunity?
- For Track 2 applications:
 - Does the proposed effort employ innovative concepts or methods?

- How logical and feasible are the approaches?
- Does the applicant recognize significant potential problems and consider alternative strategies?
- For Track 3 applications:
 - Does the plan clearly describe the current technology state and the technical advances that will result from the R&D?
 - Are the proposed technical milestones achievable within the brief duration (no more than 12 months) of a Track 3 award?
 - Can the proposed R&D goals be accomplished effectively by other means that do not require the use of a DOE National Laboratory's facilities?
- For Track 4a applications:
 - Does the plan clearly describe a viable approach to gathering the information required and developing a coherent, comprehensive business plan?
 - Is the team complete?
 - Is the approach sufficiently broad and inclusive such that companies and institutions not involved with the R&D work are likely to find the business plan valid?
- For Track4b applications:
 - Does the technical approach and work plan support the identified business plan adequately?
 - Will the work plan advance the domestic industrial TRL/MRL sufficiently to meet future U.S. accelerator facility needs?
 - Is there sufficient content in the work plan to understand how the partnership will evolve and strengthen under subsequent renewals (as needed)?
- **For all applications:**
 - Does the application clearly describe specific technical milestones that can be used to evaluate the progress of the R&D?

COMPETENCY OF APPLICANT'S PERSONNEL AND ADEQUACY OF PROPOSED RESOURCES

- For Track 1 applications:
 - Does the collaborative team have an appropriate balance of accelerator-technology-side experts and application-side experts?
 - If the application could result in a commercial product, does the team include an appropriate industrial partner?
- For Track 2 applications:
 - No additional questions.
- For Track 3 applications:
 - Does the collaborative team have an appropriate balance of accelerator-technology-side experts and application-side experts?

- If the application could result in a commercial product, does the team include an appropriate industrial partner?
- Are you aware of specific private sector resources that could be used to accomplish this R&D instead?
- For Track 4a applications:
 - Does the collaborative team have an appropriate balance of accelerator technology experts, industry experts, and experience developing long-range business plans?
- For Track 4b applications:
 - Is the work well defined and well delineated between the various partnership members?
 - Does the partnership have an appropriate balance of accelerator technology experts and industry experts?
 - Will the partnership address production workforce limitations?
- **For all applications:**
 - What is the past performance of the leading members of the collaboration?
 - Does the application clearly define the roles and responsibilities of all key participants?
 - Are the senior investigator(s) or any members of the research group that are being reviewed leaders within the proposed effort(s) and/or potential future leaders in the field?
 - Does the proposed work take advantage of unique facilities and capabilities?
 - Are the environment and facilities adequate for performing the proposed effort?

REASONABLENESS AND APPROPRIATENESS OF THE PROPOSED BUDGET

- For Track 1 and Track 3 applications:
 - Has the applicant listed institutional commitment?
 - Does the amount and type of institutional commitment provide evidence of substantial material participation and risk sharing by the institution?
- For Track 4 applications:
 - Have all partnership members clearly identified their commitment?
 - Is there any industrial cost-sharing?
- **For all applications:**
 - Are the proposed budget and staffing levels adequate to carry out the proposed work?
 - Are all travel, student costs, and other ancillary expenses adequately estimated and justified?
 - Is the budget reasonable and appropriate for the scope?

QUALITY AND EFFICACY OF THE PROMOTING INCLUSIVE AND EQUITABLE RESEARCH PLAN

- Is the proposed Promoting Inclusive and Equitable Research (PIER) Plan suitable for the size

- and complexity of the proposed project and an integral component of the proposed project?
- To what extent is the PIER plan likely to lead to participation of individuals from diverse backgrounds, including individuals historically underrepresented in the research community?
- What aspects of the PIER plan are likely to contribute to the goal of creating and maintaining an equitable, inclusive, encouraging, and professional training and research environment and supporting a sense of belonging among project personnel?
- How does the proposed plan include intentional mentorship and are the associated mentoring resources reasonable and appropriate?

As indicated above, the following questions are also provided to merit reviewers when evaluating the additional criterion:

QUALITY OF THE ACCELERATOR STEWARDSHIP OR ACCELERATOR DEVELOPMENT OPPORTUNITY

In the questions that follow, the term “stakeholder²¹” is used broadly to refer to organizations with a history of financial, intellectual, or physical support for research in the proposed subject matter. Stakeholders may be SC programs (e.g., BES, FES, HEP, or NP), other DOE program offices (e.g., NNSA, EERE, ARPA-E), other Federal agencies (e.g., NIH, NSF, DoD, DHS), or industries that use accelerator technology. Accelerator development stakeholders include SC programs developing future accelerator-based discovery science facilities.

- Does the proposed work provide significant scientific or technical advances of accelerator-related science and technology or a significant enhancement of the domestic production capability of accelerator technology? (Accelerator-related technology includes such things as: superconducting magnets and RF cavities, RF and magnet power systems, specialized laser systems, specialized diagnostics and controls, and so on.)
- Will the proposed work result in substantial impact on the stakeholder’s needs?
- For the primary participating institution(s), is the activity reasonably consistent with the institution’s primary mission? (e.g., if a National Laboratory is involved, is the activity consistent with that Laboratory’s primary mission?)
- Is the PI/collaboration arguably the best performer/provider for the Stewardship or Development activity? Are other entities capable of providing a substantially similar (or superior) capability?
- What evidence is there that the goal is important to the stakeholder? Does this application address issues that have been identified in writing (e.g., advisory committee reports, workshop reports, white papers, roadmaps) by the stakeholder? Does the stakeholder participate substantially and materially in this effort (e.g., by co-funding, cost-sharing, in-kind donation or equipment, donation of effort)?

²¹ “Stakeholder” is used throughout this FOA as a generalization of the term “Stewardship Customer”. For the Accelerator Production program, the mission needs of the SC programs are the primary focus. For the Accelerator Stewardship program, the needs of other federal agencies and industry carry similar weight to SC programmatic needs.

B. REVIEW AND SELECTION PROCESS

1. Merit Review

Applications that pass the initial review will be subjected to a formal merit review and will be evaluated based on the criteria codified at 10 CFR 605.10(d) in accordance with the guidance provided in the “Office of Science Merit Review System for Financial Assistance,” which is available at: <https://science.osti.gov/grants/policy-and-guidance/merit-review-system/>.

2. Program Policy Factors

The Selection Official may consider any of the following program policy factors in making the selection, listed in no order of significance:

The Selection Official may consider the following items, listed in order of decreasing significance:

- Merit of the proposed activity as determined by merit review, using the criteria set out in [Section V.A.2](#);
- The advice of SC Programs and other federal agencies with specific expertise and interest in the accelerator R&D topics listed in this solicitation:
 - At the pre-application phase; and
 - At the application review phase;
- Availability of funds;
- Extent to which the proposed work will:
 - Engage the expertise and facilities of the existing U.S. accelerator R&D ecosystem in a manner that enhances the ability of SC specifically, and other federal agencies generally, to benefit the Nation within their mission-spaces;
 - Enhance the accelerator technology capabilities and economic competitiveness of U.S. industry; and
 - Foster collaboration between developers of accelerator technology and experts who apply accelerator technology;
- Promoting diversity of supported Principal Investigators;
- Promoting diverse teams and partnerships;
- Promoting the diversity and equitable contributions of institutions receiving awards;
- Amount of institutional commitment offered;
- Availability and adequacy of existing accelerator fabrication and testing infrastructure and computational tools;
- Synergistic potential between the proposed activity and other activities supported by SC;
- Ensuring an appropriate balance of activities within SC programs;
- Previous performance;
- Degree to which the proposed work is synergistic with, but not duplicative of, existing awards; and
- Other available advice and information.

3. Selection

The Selection Official will consider the findings of the merit review and may consider any of the Program Policy Factors described above.

4. Review of Risk

Pursuant to 2 CFR 200.206, DOE will conduct a review of any potential risks posed by the applicant. Such review of risk will include:

- Quality of the application
- Reports and findings from audits performed under 2 CFR 200 and/or 2 CFR 910, and
- Systems maintained under 2 CFR 180

DOE may make use of other publicly available information and the history of an applicant's performance under DOE or other Federal agency awards.

Applicants with no prior performance of DOE awards may be asked to provide information about their financial stability and or their ability to comply with the management standards of 2 CFR 200.

DOE may incorporate specific award conditions of a programmatic and/or administrative nature if an applicant exhibits one or more high-risk factors under 2 CFR 200.208.

Further, DOE may conduct a review, through Government resources, of the applicant and project personnel with a connection to a foreign country. This includes, but is not limited to, (1) performance of work in, (2) travel to, and (3) awardee personnel's higher education in a foreign Country, as well as (4) partnerships with international collaborators.

The result(s) of any pre-award review of risk may supersede the results of merit review under 2 CFR 200.205, preventing DOE from selecting an application for award, reversing a selection for award, or requiring the disengagement of specific personnel. The results of any post-award review of risk may result in requiring the disengagement of specific personnel, the imposition of other requirements, or the termination of an award that "no longer effectuates the program goals or agency priorities" under 2 CFR 200.340(a)(2). 2 CFR 200.206(c).

Pursuant to 2 CFR 910.128, the results of any pre-award review of risk are not appealable. Any pre-award decision to not select an application for award, reverse a selection for award, or require the disengagement of specific personnel will be made by the Selection Official or SC Program Official. Pursuant to 2 CFR 910.128, the results of any post-award review of risk may be appealable. Any post-award decision to require the disengagement of specific personnel, the imposition of other requirements, or the termination of an award will be made by the Contracting Officer.

5. Discussions and Award

The Government may enter into discussions with a selected applicant for any reason deemed

necessary, including but not limited to the following: (1) the budget is not appropriate or reasonable for the requirement; (2) only a portion of the application is selected for award; (3) the Government needs additional information to determine that the recipient is capable of complying with the requirements in 2 CFR 200 as modified by 2 CFR 910 (DOE Financial Assistance Regulation); and/or (4) special terms and conditions are required. Failure to resolve satisfactorily the issues identified by the Government will preclude award to the applicant.

C. ANTICIPATED NOTICE OF SELECTION AND AWARD DATES

It is anticipated that the award selection will be completed by August 1, 2023. It is expected that awards will be made in Fiscal Year 2023 with an award start date of September 1, 2023.

Section VI – AWARD ADMINISTRATION INFORMATION

A. AWARD NOTICES

1. Notice of Selection

Selected Applicants Notification: DOE will notify applicants selected for award. This notice of selection is not an authorization to begin performance.

Non-selected Notification: Organizations whose applications have not been selected will be advised as promptly as possible. This notice will explain why the application was not selected.

2. Notice of Award

An Assistance Agreement issued by the DOE Contracting Officer is the authorizing award document. It normally includes, either as an attachment or by reference, the following items: (1) Special Terms and Conditions, (2) Intellectual Property Provisions, (3) Federal Assistance Reporting Checklist and Instructions, (4) Budget Pages, (5) The Research Terms and Conditions, available at https://www.nsf.gov/pubs/policydocs/rtc/rtcoverlay_march17.pdf, and DOE Agency Specific Requirements, available at <https://www.nsf.gov/awards/managing/rtc.jsp>, (6) Applicable program regulations, 10 CFR 605 at <https://www.ecfr.gov/>, (7) DOE Assistance Regulations, 2 CFR 200 as amended by 2 CFR 910 at <https://www.ecfr.gov/>, (8) Application/proposal as approved by DOE, and (9) National Policy Assurances to Be Incorporated as Award Terms in effect on date of award at <https://www.nsf.gov/awards/managing/rtc.jsp>.

TERMS AND CONDITIONS

Sample DOE Special Terms and Conditions for Use in Most Grants and Cooperative Agreements are located at <https://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms> under Award Terms.

The standard DOE financial assistance intellectual property provisions applicable to various types of recipients are located at:
<https://energy.gov/gc/standard-intellectual-property-ip-provisions-financial-assistance-awards>.

NATIONAL POLICY ASSURANCES

The National Policy Assurances To Be Incorporated As Award Terms are located at <https://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms> under Award Terms.

B. ADMINISTRATIVE AND NATIONAL POLICY REQUIREMENTS

The following additional policy provisions are applicable to this FOA. The full text of each provision is in [Section VIII](#) of this FOA and may be accessed by navigating to the hyperlinks below:

- [1. Evaluation and Administration by Non-Federal Personnel](#)
- [2. Government Right to Reject or Negotiate](#)
- [3. Intergovernmental Review](#)
- [4. Modifications](#)

Awards made under this FOA are subject to the following Administrative and National Policy Requirements. The full text of each provision is in [Section VIII](#) of this FOA and may be accessed by navigating to the hyperlinks below:

- [1. Administrative Requirements](#)
- [2. Availability of Funds](#)
- [3. Buy America Requirement for Infrastructure Projects](#)
- [4. Conference Spending \(February 2015\)](#)
- [5. Commitment of Public Funds](#)
- [6. Corporate Felony Conviction and Federal Tax Liability Representations \(March 2014\)](#)
- [7. Environmental, Safety and Health \(ES&H\) Performance of Work at DOE Facilities](#)
- [8. Federal, State, and Local Requirements](#)
- [9. Funding Restrictions](#)
- [10. National Environmental Policy Act \(NEPA\) Compliance](#)
- [11. Nondisclosure and Confidentiality Agreements Representations \(June 2015\)](#)
- [12. Notice Regarding Eligible/Ineligible Activities](#)
- [13. Prohibition on Discrimination and Harassment](#)
- [14. Prohibition on Lobbying Activity](#)
- [15. Proprietary Application Information](#)
- [16. Publications](#)
- [17. Registration Requirements](#)
- [18. Research Misconduct](#)
- [19. Rights in Technical Data](#)
- [20. Subaward and Executive Reporting](#)
- [21. Title to Subject Inventions](#)
- [22. U.S. Competitiveness](#)

C. REPORTING

Reporting requirements are identified on the Federal Assistance Reporting Checklist, DOE F 4600.2, attached to the award agreement. The standard checklist is available at <http://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms> under Award Forms: Individual awards may impose additional requirements.

D. REPORTING OF MATTERS RELATED TO RECIPIENT INTEGRITY AND PERFORMANCE (DECEMBER 2015)

DOE, prior to making a Federal award with a total amount of Federal share greater than the simplified acquisition threshold, is required to review and consider any information about the applicant that is in the designated integrity and performance system accessible through SAM

(currently FAPIIS) (see 41 USC 2313).

The applicant, at its option, may review information in the designated integrity and performance systems accessible through SAM and comment on any information about itself that a Federal awarding agency previously entered and is currently in the designated integrity and performance system accessible through SAM.

DOE will consider any written comments by the applicant, in addition to the other information in the designated integrity and performance system, in making a judgment about the applicant's integrity, business ethics, and record of performance under Federal awards when completing the review of risk posed by applicants as described in 2 CFR 200.206 Federal awarding agency review of risk posed by applicants.

E. INTERIM CONFLICT OF INTEREST POLICY FOR FINANCIAL ASSISTANCE

1. Policy

The DOE interim Conflict of Interest Policy for Financial Assistance (COI Policy) can be found at <https://www.energy.gov/management/department-energy-interim-conflict-interest-policy-requirements-financial-assistance>. This policy is applicable to all non-Federal entities applying for, or that receive, DOE funding by means of a financial assistance award (e.g., a grant, cooperative agreement, or technology investment agreement) and, through the implementation of this policy by the entity, to each Investigator who is planning to participate in, or is participating in, the project funded wholly or in part under the DOE financial assistance award. DOE's interim COI Policy establishes standards that provide a reasonable expectation that the design, conduct, and reporting of projects funded wholly or in part under DOE financial assistance awards will be free from bias resulting from financial conflicts of interest or organizational conflicts of interest. The applicant is subject to the requirements of the interim COI Policy and within each application for financial assistance, the applicant must certify that it is, or will be by the time of receiving any financial assistance award, compliant with all requirements in the interim COI Policy. The applicant must flow down the requirements of the interim COI Policy to any subrecipient non-Federal entities.

2. SC Implementation

SC only requires that unmanaged or unmanageable financial conflicts of interest be included in the financial conflict of interest (FCOI) report.

Section VII - QUESTIONS/AGENCY CONTACTS

A. QUESTIONS

Questions relating to the Grants.gov registration process, system requirements, how an application form works, or the submittal process must be directed to Grants.gov at 1-800-518-4726 or support@Grants.gov. DOE cannot answer these questions. Please only contact the Grants.gov help desk for questions related to Grants.gov.

For help with PAMS, click the “PAMS Help” link on the PAMS website, <https://pamspublic.science.energy.gov/>. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9:00 AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free) or (301) 903-9610, Email: sc.pams-helpdesk@science.doe.gov. All submission and inquiries about this FOA should reference the FOA number on the cover of this Announcement. Please contact the PAMS help desk for technological issues with the PAMS system.

Questions regarding the specific program areas and technical requirements may be directed to the technical contacts listed for each program within the FOA or below. Please contact the program staff with all questions not directly related to the Grants.gov or PAMS systems.

B. AGENCY CONTACTS

Grants.gov Customer Support	800-518-4726 (toll-free) support@Grants.gov
PAMS Customer Support	855-818-1846 (toll-free) 301-903-9610 sc.pams-helpdesk@science.doe.gov
Program Manager Scientific Contact	Eric Colby, Eric.Colby@science.doe.gov , 301-903-5475

Section VIII – SUPPLEMENTARY MATERIAL

A. HOW-TO GUIDES

1. How to Distinguish Between a New and Renewal Application

New Application: An application must be submitted as “new” in the following circumstances:

- When applying for funding to create a new research award that has not previously received DOE funding, including any funding for the current year,
- When applying for funding to support continued research from the same applicant institution as the current grant but with a significant change in fundamental nature of the research, or
- When applying for funding to support continued research supported by an existing DOE award but at a new applicant institution.

Renewal Application: A renewal application is appropriate when funds are requested for an award that has no changes in the following items:

- The recipient/applicant institution,
- The award’s senior leadership, and
- The fundamental nature of the award.

A change in an award’s PI does not necessarily require submission as a new application: The change in personnel must be considered in light of other changes.

Renewal applications compete for funds with all other peer-reviewed applications and must be developed as fully as though the applicant were applying for the first time. Renewal applications must be submitted by the same sponsoring institution as that holding the current award for which renewal funding is requested, and the proposed research topic must be logical scientific extensions of the research that has been performed in the current award.

2. How Federally Affiliated Organizations May Participate and Be Funded

VALUE/FUNDING FOR DOE/NNSA NATIONAL LABORATORIES AND NON-DOE/NNSA FFRDCs

For grant awards, the value of, and funding for, a DOE/NNSA National Laboratory contractor, a non-DOE/NNSA Federally Funded Research and Development Center (FFRDC) contractor, or another Federal agency’s portion of the work will not be included in the award to the successful applicant. DOE will fund a DOE/NNSA National Laboratory contractor through the DOE field work authorization system or other appropriate process and may fund non-DOE/NNSA FFRDC contractors and other Federal agencies through an interagency agreement in accordance with the Economy Act, 31 USC 1535, or other statutory authority.

RESPONSIBILITY

The successful prime applicant/awardee (lead organization) will be the responsible authority regarding the settlement and satisfaction of all contractual and administrative issues, including but not limited to, disputes and claims arising out of any agreement between the applicant and

any team member, and/or subrecipient.

If an award is made to a DOE/NNSA National Laboratory, all Disputes and Claims will be resolved in accordance with the terms and conditions of the DOE/NNSA National Laboratory's management and operating (M&O) contract, as applicable, in consultation between DOE and the prime awardee.

If an award is made to another Federal agency or its FFRDC contractor, all Disputes and Claims will be resolved in accordance with the terms and conditions of the interagency agreement in consultation between DOE and the prime awardee.

3. How Federally Affiliated Organizations May Apply

DOE/NNSA NATIONAL LABORATORIES

DOE/NNSA National Laboratories, if eligible either as a prime applicant or a proposed team member on another entity's application, should ensure that their cognizant DOE/NNSA Contracting Officer provides written authorization. This authorization should be submitted with the application as part of the Budget Justification for DOE/NNSA National Laboratory Contractor File. [This is not required for the National Energy Technology Laboratory because it is a Government Owned/Government Operated (GOGO) Laboratory.] **Please note that failure to provide this authorization may result in rejection of an application prior to merit review.** If a DOE/NNSA National Laboratory Contractor is selected for award, or proposed as a team member, the proposed work will be authorized under the DOE field work authorization system or other appropriate process and performed under the laboratory Contractor's M&O contract, as applicable. The following wording is acceptable for the authorization:

“Authorization is granted for the _____ Laboratory to participate in the proposed project. The work proposed for the laboratory is consistent with or complementary to the missions of the laboratory and will not adversely impact execution of the DOE/NNSA assigned programs at the laboratory.”

(end of acceptable authorization)

If a DOE/NNSA FFRDC is selected for award negotiation, the proposed work will be authorized under the DOE work authorization process and performed under the laboratory's Management and Operating (M&O) contract.

NON-DOE/NNSA FFRDCs

Non-DOE/NNSA FFRDCs, if eligible either as a prime applicant or a proposed team member on another entity's application, should follow the following guidelines:

The prime applicant must obtain written authorization for non-DOE/NNSA FFRDC participation. The cognizant Contracting Officer for the Federal agency sponsoring the FFRDC contractor must authorize in writing the participation of the FFRDC contractor on the proposed

project and this authorization should be submitted with the application. The written authorization must also contain a determination that the use of a FFRDC contractor is consistent with the contractor's authority under its award and does not place the FFRDC contractor in direct competition with the private sector, in accordance with FAR Part 17.5. **Please note that failure to provide this authorization may result in rejection of an application prior to merit review.** The following wording is acceptable for the authorization:

“Authorization is granted for the _____ Laboratory to participate in the proposed project. The work proposed for the laboratory is consistent with or complementary to the missions of the laboratory and will not adversely impact execution of the (insert agency) assigned programs at the laboratory. This laboratory is authorized to perform the work proposed in the application submitted under DOE Funding Opportunity Announcement <<Include the FOA number on the cover page>> by the following statutory authority (insert statute name, citation, and section).”

(end of acceptable authorization)

OTHER FEDERAL AGENCIES

Other Federal Agencies, if eligible either as a prime applicant or a proposed team member on another entity's application, must include in their budget justifications any specific statutory authorization (other than the Economy Act) that permits their receipt of an interagency agreement or that authorizes the payment of certain costs.

4. How Consortia May be Used

INCORPORATED CONSORTIA

Incorporated consortia are eligible to apply for funding as a prime recipient (lead organization) or subrecipient (team member).

Each incorporated consortium must have an internal governance structure and a written set of internal rules. Upon request, the consortium must provide a written description of its internal governance structure and its internal rules to the DOE Contracting Officer. There is no requirement that subawards be formalized into incorporated consortia.

UNINCORPORATED CONSORTIA

Unincorporated consortia (team arrangements) must designate one member of the consortium to serve as the prime recipient/consortium representative (lead organization). There is no requirement that subawards be formalized into unincorporated consortia.

Upon request, unincorporated consortia must provide the DOE Contracting Officer with a collaboration agreement, commonly referred to as the articles of collaboration, which sets out the rights and responsibilities of each consortium member. This agreement binds the individual consortium members together and should discuss, among other things, the consortium's:

- Management structure;
- Method of making payments to consortium members;
- Means of ensuring and overseeing members' efforts on the project;
- Provisions for members' cost sharing contributions (though neither required nor considered); and
- Provisions for ownership and rights in intellectual property developed previously or under the agreement.

Note that a consortium is applied for in one application and results in one award with subawards to consortia members. Multi-institutional teams may, if permitted under this FOA, submit collaborative applications with each institution submitting its own application with an identical research narrative, resulting in multiple awards to the collaborating institutions.

5. How to Submit Letters of Intent

Do not submit an LOI unless an FOA requires or allows their submission.

It is important that the LOI be a single file with extension .pdf, .docx, or .doc. The filename must not exceed 50 characters. The PI and anyone submitting on behalf of the PI must register for an account in PAMS before it will be possible to submit a LOI. **All PIs and those submitting LOIs on behalf of PIs are encouraged to establish PAMS accounts as soon as possible to avoid submission delays.**

Submit Your Letter of Intent:

- Create your LOI outside the system and save it as a file with extension .docx, .doc, or .pdf. Make a note of the location of the file on your computer so you can browse for it later from within PAMS.
- Log into PAMS and click the Proposals tab. Click the "View / Respond to Funding Opportunity Announcements" link and find the current announcement in the list. Click the "Actions/Views" link in the Options column next to this announcement to obtain a dropdown menu. Select "Submit Letter of Intent" from the dropdown.
- On the Submit Letter of Intent page, select the institution from which you are submitting this LOI from the Institution dropdown. If you are associated with only one institution in the system, there will only be one institution in the dropdown.
- Note that you must select one and only one PI per LOI; to do so, click the "Select PI" button on the far right side of the screen. Find the appropriate PI from the list of all registered users from your institution returned by PAMS. (Hint: You may have to sort, filter, or search through the list if it has multiple pages.) Click the "Actions" link in the Options column next to the appropriate PI to obtain a dropdown menu. From the dropdown, choose "Select PI."
- If the PI for whom you are submitting does not appear on the list, it means he or she has not yet registered in PAMS. For your convenience, you may have PAMS send an email invitation to the PI to register in PAMS. To do so, click the "Invite PI" link at the top left of the "Select PI" screen. You can enter an optional personal message to the PI in the "Comments" box, and it will be included in the email sent by PAMS to the PI. You must wait until the PI registers before you can submit the LOI. Save the LOI for later work by clicking

the “Save” button at the bottom of the screen. It will be stored in “My Letters of Intent” for later editing.

- Enter a title for your LOI.
- Select the appropriate technical contact from the Program Manager dropdown.
- To upload the LOI file into PAMS, click the “Attach File” button at the far right side of the screen. Click the “Browse” (or “Choose File” depending on your browser) button to search for your file. You may enter an optional description of the file you are attaching. Click the “Upload” button to upload the file.
- At the bottom of the screen, click the “Submit to DOE” button to save and submit the LOI to DOE.
- Upon submission, the PI will receive an email from the PAMS system <PAMS.Autoreply@science.doe.gov> acknowledging receipt of the LOI.

You are encouraged to register for an account in PAMS at least a week in advance of the LOI submission deadline so that there will be no delays with your submission.

WARNING: The PAMS website at <https://pamspublic.science.energy.gov/> will permit you to edit a previously submitted LOI in the time between your submission and the deadline. If you choose to edit, doing so will remove your previously submitted version from consideration. If you are still editing at the time of the deadline, you will not have a valid submission. Please pay attention to the deadline.

Do not attach pre-applications to Field 21 of the SF-424(R&R) form or letters of intent to Field 21 of the SF-424(R&R) form. Doing so will render your application unreadable.

6. How to Submit a Pre-Application

Do not submit a pre-application unless an FOA requires or permits their submission.

It is important that the pre-application be a single file with extension .pdf, .docx, or .doc. The filename must not exceed 50 characters. The PI and anyone submitting on behalf of the PI must register for an account in PAMS before it will be possible to submit a pre-application. All PIs and those submitting pre-applications on behalf of PIs are encouraged to establish PAMS accounts as soon as possible to avoid submission delays.

Submit Your Pre-Application:

- Create your pre-application (called a preproposal in PAMS) outside the system and save it as a file with extension .docx, .doc, or .pdf. Make a note of the location of the file on your computer so you can browse for it later from within PAMS.
- Log into PAMS and click the Proposals tab. Click the “View / Respond to Funding Opportunity Announcements” link and find the current announcement in the list. Click the “Actions/Views” link in the Options column next to this announcement to obtain a dropdown menu. Select “Submit Preproposal” from the dropdown.

- On the Submit Preproposal page, select the institution from which you are submitting this preproposal from the Institution dropdown. If you are associated with only one institution in the system, there will only be one institution in the dropdown.
- Note that you must select one and only one PI per preproposal; to do so, click the “Select PI” button on the far right side of the screen. Find the appropriate PI from the list of all registered users from your institution returned by PAMS. (Hint: You may have to sort, filter, or search through the list if it has multiple pages.) Click the “Actions” link in the Options column next to the appropriate PI to obtain a dropdown menu. From the dropdown, choose “Select PI.”
- If the PI for whom you are submitting does not appear on the list, it means he or she has not yet registered in PAMS. For your convenience, you may have PAMS send an email invitation to the PI to register in PAMS. To do so, click the “Invite PI” link at the top left of the “Select PI” screen. You can enter an optional personal message to the PI in the “Comments” box, and it will be included in the email sent by PAMS to the PI. You must wait until the PI registers before you can submit the preproposal. Save the preproposal for later work by clicking the “Save” button at the bottom of the screen. It will be stored in “My Preproposals” for later editing.
- Enter a title for your preproposal.
- Select the appropriate technical contact from the Program Manager dropdown.
- To upload the preproposal file into PAMS, click the “Attach File” button at the far right side of the screen. Click the “Browse” (or “Choose File” depending on your browser) button to search for your file. You may enter an optional description of the file you are attaching. Click the “Upload” button to upload the file.
- At the bottom of the screen, click the “Submit to DOE” button to save and submit the preproposal to DOE.
- Upon submission, the PI will receive an email from the PAMS system <PAMS.Autoreply@science.doe.gov> acknowledging receipt of the preproposal.

You are encouraged to register for an account in PAMS at least a week in advance of the preproposal submission deadline so that there will be no delays with your submission.

WARNING: The PAMS website at <https://pamspublic.science.energy.gov> will permit you to edit a previously submitted pre-application in the time between your submission and the deadline. If you choose to edit, doing so will remove your previously submitted version from consideration. If you are still editing at the time of the deadline, you will not have a valid submission. Please pay attention to the deadline.

Do not attach pre-applications to Field 21 of the SF-424(R&R) form or letters of intent to Field 21 of the SF-424(R&R) form. Doing so will render your application unreadable.

7. How to Register and Submit an Application in Grants.gov

This section provides the application submission and receipt instructions for applications to SC. Please read the following instructions carefully and completely.

ELECTRONIC DELIVERY

SC is participating in the Grants.gov initiative to provide the grant community with a single site to find and apply for grant funding opportunities. SC requires applicants to submit their applications online through Grants.gov.

HOW TO REGISTER TO APPLY THROUGH GRANTS.GOV

a. Instructions: Read the instructions below about registering to apply for SC funds. Applicants should read the registration instructions carefully and prepare the information requested before beginning the registration process. Reviewing and assembling the required information before beginning the registration process will alleviate last-minute searches for required information.

Organizations must have an active System for Award Management (SAM) registration which provides a Unique Entity Identifier (UEI), and Grants.gov account to apply for grants. If individual applicants (those submitting on their own behalf) are eligible to apply for this funding opportunity, they need only refer to steps 2 and 3 below.

Creating a Grants.gov account can be completed online in minutes, but SAM registration may take several weeks. Therefore, an organization's registration should be done in sufficient time to ensure it does not impact the entity's ability to meet required application submission deadlines.

Complete organization registration instructions can be found on Grants.gov here:
<https://www.Grants.gov/web/grants/applicants/organization-registration.html>

1) *Register with SAM*: All organizations applying online through Grants.gov must register with SAM at <https://www.sam.gov>. Failure to register with SAM will prevent your organization from applying through Grants.gov. SAM registration must be renewed annually. For more detailed instructions for registering with SAM, refer to: <https://www.grants.gov/web/grants/applicants/organization-registration.html>

2) *Create a Grants.gov Account*: The next step is to register an account with Grants.gov. Follow the on-screen instructions provided on the registration page.

3) *Add a Profile to a Grants.gov Account*: A profile in Grants.gov corresponds to a single applicant organization the user represents (i.e., an applicant) or an individual applicant. If you work for or consult with multiple organizations and have a profile for each, you may log in to one Grants.gov account to access all of your grant applications. To add an organizational profile to your Grants.gov account, enter the UEI (Unique Entity Identifier) for the organization in the UEI field. If you are an individual applicant submitting on your own behalf, you do not need a UEI to add the profile. For more detailed instructions about creating a profile on Grants.gov, refer to: <https://www.Grants.gov/web/grants/applicants/registration/add-profile.html>

4) *EBiz POC Authorized Profile Roles*: After you register with Grants.gov and create an Organization Applicant Profile, the organization applicant's request for Grants.gov roles and access is sent to the Electronic Business Point of Contact (EBiz POC). The EBiz

POC will then log in to Grants.gov and authorize the appropriate roles, which may include the Authorized Organization Representative (AOR) role, thereby giving you permission to complete and submit applications on behalf of the organization. You will be able to submit your application online any time after you have been assigned the AOR role. For more detailed instructions about creating a profile on Grants.gov, refer to: <https://www.Grants.gov/web/grants/applicants/registration/authorize-roles.html>

5) *Track Role Status*: To track your role request, refer to: <https://www.Grants.gov/web/grants/applicants/registration/track-role-status.html>

b. *Electronic Signature*: When applications are submitted through Grants.gov, the name of the organization applicant with the AOR role that submitted the application is inserted into the signature line of the application, serving as the electronic signature. The EBiz POC **must** authorize people who are able to make legally binding commitments on behalf of the organization as a user with the AOR role; **this step is often missed and it is crucial for valid and timely submissions.**

HOW TO SUBMIT AN APPLICATION TO SC VIA GRANTS.GOV

Grants.gov applicants can apply online using Workspace. Workspace is a shared, online environment where members of a grant team may simultaneously access and edit different webforms within an application. For each FOA, you can create individual instances of a workspace.

Below is an overview of applying on Grants.gov. For access to complete instructions on how to apply for opportunities, refer to:

<https://www.Grants.gov/web/grants/applicants/apply-for-grants.html>

- 1) Create a Workspace: Creating a workspace allows you to complete it online and route it through your organization for review before submitting.
- 2) Complete a Workspace: Add participants to the workspace to work on the application together, complete all the required forms online or by downloading PDF versions, and check for errors before submission. The Workspace progress bar will display the state of your application process as you apply. As you apply using Workspace, you may click the blue question mark icon near the upper-right corner of each page to access context-sensitive help.

a. Adobe Reader: If you decide not to apply by filling out webforms you can download individual PDF forms in Workspace so that they will appear similar to other Standard forms. The individual PDF forms can be downloaded and saved to your local device storage, network drive(s), or external drives, then accessed through Adobe Reader.

NOTE: Visit the Adobe Software Compatibility page on Grants.gov to download the appropriate version of the software at:

<https://www.Grants.gov/web/grants/applicants/adobe-software-compatibility.html>

b. Mandatory Fields in Forms: In the forms, you will note fields marked with an asterisk and a different background color. These fields are mandatory fields that must be completed to successfully submit your application.

c. Complete SF-424 Fields First: These forms are designed to fill in common required fields across other forms, such as the applicant name, address, and SAM UEI. Once it is completed, the information will transfer to the other forms.

3) Submit a Workspace: An application may be submitted through workspace by clicking the Sign and Submit button on the Manage Workspace page, under the Forms tab. Grants.gov recommends submitting your application package *at least 24-48 hours prior to the close date* to provide you with time to correct any potential technical issues that may disrupt the application submission.

4) Track a Workspace: After successfully submitting a workspace package, a Grants.gov Tracking Number (GRANTXXXXXXXX) is automatically assigned to the package. The number will be listed on the Confirmation page that is generated after submission.

For additional training resources, including video tutorials, refer to:

<https://www.Grants.gov/web/grants/applicants/applicant-training.html>

Applicant Support: Grants.gov provides applicants 24/7 support via the toll-free number 1-800-518-4726 and email at support@Grants.gov. For questions related to the specific grant opportunity, contact the number listed in the application package of the grant you are applying for.

If you are experiencing difficulties with your submission, it is best to call the Grants.gov Support Center and get a ticket number. The Support Center ticket number will assist SC with tracking your issue and understanding background information on the issue.

TIMELY RECEIPT REQUIREMENTS AND PROOF OF TIMELY SUBMISSION

Proof of timely submission is automatically recorded by Grants.gov. An electronic date/time stamp is generated within the system when the application is successfully received by Grants.gov. The applicant AOR will receive an acknowledgement of receipt and a tracking number (GRANTXXXXXXXX) from Grants.gov with the successful transmission of their application. Applicant AORs will also receive the official date/time stamp and Grants.gov Tracking number in an email serving as proof of their timely submission.

When SC successfully retrieves the application from Grants.gov, and acknowledges the download of submissions, Grants.gov will provide an electronic acknowledgment of receipt of the application to the email address of the applicant with the AOR role. Again, proof of timely submission shall be the official date and time that Grants.gov receives your application. Applications received by Grants.gov after the established due date for the program will be considered late and may not be considered for funding by SC.

Applicants using unreliable internet connections should be aware that the process of completing the Workspace can take some time. Therefore, applicants should allow enough time to prepare and submit the application before the package closing date.

Grants.gov will provide either an error or a successfully received submission message in the form of an email sent to the applicant with the AOR role attempting to submit the application.

If you do not promptly receive an email from Grants.gov with an agency tracking number, indicating receipt of the application by SC, please contact the Grants.gov Helpdesk at 800-518-4726 (toll-free) or support@Grants.gov immediately. SC will have no records of your attempted submission without the second email from Grants.gov.

8. How to Prepare an Application

APPLICATION PREPARATION

You must submit the application through Grants.gov at <https://www.Grants.gov/>, using either the online webforms or downloaded forms. (Additional instructions are provided in [7., above.](#))

You are required to use the compatible version of Adobe Reader software to complete a [Grants.gov](#) Adobe application package. To ensure you have the [Grants.gov](#) compatible version of Adobe Reader, visit the software compatibility page at <https://www.Grants.gov/web/grants/applicants/adobe-software-compatibility.html>.

You must complete the mandatory forms and any applicable optional forms (e.g., Disclosure of Lobbying Activities (SF-LLL)) in accordance with the instructions on the forms and the additional instructions below.

Files that are attached to the forms must be PDF files unless otherwise specified in this FOA. Attached PDF files must be plain files consisting of text, numbers, and images without editable fields, signatures, passwords, redactions, or other advanced features available in some PDF-compatible software. Do not use PDF portfolios or binders.

Please note the following restrictions that apply to the names of all files attached to your application:

- Please limit file names to 50 or fewer characters
- Do not attach any documents with the same name. All attachments must have a unique name.
- Please use only the following characters when naming your attachments: A-Z, a-z, 0-9, underscore, hyphen, space, period, parenthesis, curly braces, square brackets, ampersand, tilde, exclamation point, comma, semi colon, apostrophe, at sign, number sign, dollar sign, percent sign, plus sign, and equal sign. Attachments that do not follow this rule may cause the entire application to be rejected or cause issues during processing.

RENEWAL APPLICATIONS

For renewal applications only, the PI is required to submit a Renewal Proposal Products section

through the PAMS website at <https://pamspublic.science.energy.gov>. The PI must enter into PAMS each product created during the course of the previous project period. Types of products include publications, intellectual property, technologies or techniques, and other products such as databases or software. As soon as the renewal application is assigned to a DOE Program Manager, the PI will receive an automated email from PAMS (<PAMS.Autoreply@science.doe.gov>) instructing him or her to navigate to the PAMS Task tab to complete and submit the Renewal Proposal Products. The submitted product list will be sent for merit review as part of the application. The application will not be considered complete and cannot be sent for review until the product list has been submitted.

RESUBMISSION OF APPLICATIONS

Applications submitted under this FOA may be withdrawn from consideration by using the PAMS website at <https://pamspublic.science.energy.gov>. Applications may be withdrawn at any time between when the applicant submits the application and when DOE makes the application available to merit reviewers. Such withdrawals take effect immediately and cannot be reversed. Please exercise due caution. After the application is made available to merit reviewers, the applicant may contact the DOE program office identified in this FOA to request that it be withdrawn.

After an application is withdrawn, it may be resubmitted, if this FOA is still open for the submission of applications. Such resubmissions will only count as one submission if this FOA restricts the number of applications from an applicant.

Note that there may be a delay between the application's submission in Grants.gov and when it is available to be withdrawn in PAMS. SC will usually consider the last submission, according to its Grants.gov timestamp, to be the intended version. Please consult with your program manager to resolve any confusion about which version of an application should be considered.

IMPROPER CONTENTS OF APPLICATIONS

Applications submitted under this FOA will be stored in controlled-access systems, but they may be made publicly available if an award is made. As such, it is critical that applicants follow these guidelines:

- Do not include information subject to any legal restriction on its open distribution, whether classified, export control, or unclassified controlled nuclear information.
- Do not include sensitive and protected personally identifiable information, including social security numbers, birthdates, citizenship, marital status, or home addresses. Pay particular attention to the content of biographical sketches and curriculum vitae.
- Do not include letters of support from Federal officials.
- Do not include letters of support on Federal letterhead. Letters that are not letters of support (such as letters confirming access to sites, facilities, equipment, or data; or letters from cognizant Contracting Officers) may be on Federal letterhead.
- Clearly mark all proprietary or trade-secret information.

CHANGE OF AWARDEE INSTITUTION

If an awardee chooses to relinquish an award made under this FOA to permit the transfer of the award to a new institution, the new institution must submit an application under the then-available SC “annual” or “open” FOA.

9. How to Prepare a Biographical Sketch

A biographical sketch is to provide information that can be used by reviewers to evaluate the PI’s potential for leadership within the scientific community. Examples of information of interest are invited and/or public lectures, awards received, scientific program committees, conference or workshop organization, professional society activities, special international or industrial partnerships, reviewing or editorship activities, or other scientific leadership experiences.

SC requires the use of the format approved by the National Science Foundation (NSF), which may be generated by the Science Experts Network Curriculum Vitae (SciENcv), a cooperative venture maintained at <https://www.ncbi.nlm.nih.gov/sciencv/>, and is also available at <https://nsf.gov/bfa/dias/policy/nsfapprovedformats/biosketch.pdf>. If an interagency common format for a biographical sketch has been promulgated, that format must be used in an application. The use of a format required by another agency is intended to reduce the administrative burden to researchers by promoting the use of common formats.

The biographical information (curriculum vitae) must include the following items within its page limit:

- **Education and Training:** Undergraduate, graduate and postdoctoral training, provide institution, major/area, degree and year.
- **Research and Professional Experience:** Beginning with the current position, list professional/academic positions in chronological order with a brief description. List all current academic, professional or institutional appointments, foreign or domestic, at the applicant institution or elsewhere, whether or not remuneration is received, and, whether full-time, part-time, or voluntary.
- **Publications:** Provide a list of up to 10 publications most closely related to the proposed project. For each publication, identify the names of all authors (in the same sequence in which they appear in the publication), the article title, book or journal title, volume number, page numbers, year of publication, and website address if available electronically. Patents, copyrights and software systems developed may be provided in addition to or substituted for publications. An abbreviated style such as the Physical Review Letters (PRL) convention for citations (list only the first author) may be used for publications with more than 10 authors.
- **Synergistic Activities:** List no more than five professional and scholarly activities related to the effort proposed.

Requested information may be appended to a biographical sketch, whether produced from a fillable PDF or in SciENcv.

Do not attach a listing of individuals who should not be used as merit reviewers: This information is no longer collected as part of a biographical sketch.

SC strongly recommends the use of SciENcv to reduce administrative burden by allowing the use of digital persistent identifiers, including the Open Researcher and Contributor ID (ORCID). Biographical sketches must be attached to the Research and Related Senior/Key Person Profile (Expanded) form in an application.

Personally Identifiable Information: Do not include sensitive and protected personally identifiable information including social security numbers, birthdates, citizenship, marital status, or home addresses. Do not include information that a merit reviewer should not make use of.

10. How to Prepare a List of Individuals Who Should Not Serve as Reviewers

To assist in identifying individuals who should not serve as merit reviews, provide the following information for each and every senior/key person who is planned to be or is identified in Section A of the R&R Budget for the applicant and any proposed subrecipients:

- Advisees (graduate students or postdocs) of the senior/key person
- Advisors of the senior/key person while a graduate student or a postdoc
- Close associates of the senior/key person over the past 48 months
- Co-authors of the senior/key person over the past 48 months
- Co-editors of the senior/key person over the past 48 months
- Co-investigators of the senior/key person over the past 48 months
- Collaborators of the senior/key person over the past 48 months

Do not identify any personnel at the applicant institution or any proposed subrecipient or team institution: Those personnel are prohibited from serving as merit reviewers.

Large collaborations of 10 or more researchers do not require that all collaborators be identified: rather, only list the researchers with whom the senior/key person actually collaborated.

For all identified individuals, provide the following information:

- The senior/key person to whom the individual was an advisee, advisor, close associate, co-author, co-editor, co-investigator, or collaborator, identified by first name and last name
- The individual's first (given) name
- The individual's last (family) name
- The individual's Open Researcher and Contributor ID (ORCID), if known
- The individual's institutional affiliation spelling out acronyms (For joint appointments, separate each institution with a slash ("/")). Do not list departmental affiliations.)
- The reason for listing the individual (advisee, advisor, close associate, co-author, co-editor, co-investigator, collaborator)
- The year when the individual last was a close associate, co-author, co-editor, co-investigator, or collaborator

You may also provide a list of all senior/key personnel who are planned to be or are identified in Section A of the R&R Budget for the applicant and any proposed subrecipients.

The lists do not need to be sorted in any method.

The lists must be submitted in tabular format, preferably as Microsoft Excel (.xls or .xlsx) files.

For your convenience, a template is available at <https://science.osti.gov/grants/Policy-and-Guidance/Agreement-Forms>. The template may also be posted with this FOA in Grants.gov. If using the template:

- Do not add tabs to the spreadsheet
- Do not merge the existing tabs
- Do not remove headers
- Fill out the requested headers on both tabs with the same information
- Ensure that given and family names are presented in the correct columns

11. How to Prepare Current and Pending Support

WARNING: These instructions have been significantly revised to require disclosure of a variety of potential conflicts of interest or commitment, including participation in foreign government-sponsored talent recruitment programs.

Current and Pending support is intended to allow the identification of potential duplication, overcommitment, potential conflicts of interest or commitment, and all other sources of support. The PI and each senior/key person at the prime applicant and any proposed subaward must provide a list of all sponsored activities, awards, and appointments, whether paid or unpaid; provided as a gift with terms or conditions or provided as a gift without terms or conditions; full-time, part-time, or voluntary; faculty, visiting, adjunct, or honorary; cash or in-kind; foreign or domestic; governmental or private-sector; directly supporting the individual's research or indirectly supporting the individual by supporting students, research staff, space, equipment, or other research expenses. All foreign government-sponsored talent recruitment programs must be identified in current and pending support.

SC requires the use of the format approved by the National Science Foundation (NSF), which may be generated by the Science Experts Network Curriculum Vitae (SciENCv), a cooperative venture maintained at <https://www.ncbi.nlm.nih.gov/sciencv/>, and is also available at <https://www.nsf.gov/bfa/dias/policy/nsfapprovedformats/cps.pdf>. If an interagency common format for current and pending support has been promulgated, that format must be used in an application. The use of a format required by another agency is intended to reduce the administrative burden to researchers by promoting the use of common formats.

For every activity, list the following items:

- The sponsor of the activity or the source of funding.
- The award or other identifying number.
- The title of the award or activity. If the title of the award or activity is not descriptive, add a brief description of the research being performed that would identify any overlaps or synergies with the proposed research.
- The total cost or value of the award or activity, including direct and indirect costs. For pending proposals, provide the total amount of requested funding.
- The award period (start date – end date).

- The person-months of effort per year being dedicated to the award or activity.

If required to identify overlap, duplication of effort, or synergistic efforts, append a description of the other award or activity to the current and pending support.

Requested information may be appended to current and pending support, whether produced from a fillable PDF or in SciENCv.

SC strongly recommends the use of SciENCv to reduce administrative burden by allowing the use of digital persistent identifiers, including the Open Researcher and Contributor ID (ORCID). Current and pending support must be attached to the Research and Related Senior/Key Person Profile (Expanded) form in an application.

Details of any obligations, contractual or otherwise, to any program, entity, or organization sponsored by a foreign government must be provided on request to either the applicant institution or DOE.

12. How to Prepare a Data Management Plan

In general, a DMP should address the following requirements:

1. DMPs should describe whether and how data generated in the course of the proposed research will be shared and preserved. If the plan is not to share and/or preserve certain data, then the plan must explain the basis of the decision (for example, cost/benefit considerations, other parameters of feasibility, scientific appropriateness, or limitations discussed in #4). At a minimum, DMPs must describe how data sharing and preservation will enable validation of results, or how results could be validated if data are not shared or preserved.
2. DMPs should provide a plan for making all research data displayed in publications resulting from the proposed research open, machine-readable, and digitally accessible to the public at the time of publication. This includes data that are displayed in charts, figures, images, etc. In addition, the underlying digital research data used to generate the displayed data should be made as accessible as possible to the public in accordance with the principles stated in the Office of Science Statement on Digital Data Management (<https://science.osti.gov/funding-opportunities/digital-data-management>). This requirement could be met by including the data as supplementary information to the published article, or through other means. The published article should indicate how these data can be accessed.
3. DMPs should consult and reference available information about data management resources to be used in the course of the proposed research. In particular, DMPs that explicitly or implicitly commit data management resources at a facility beyond what is conventionally made available to approved users should be accompanied by written approval from that facility. In determining the resources available for data management at Office of Science User Facilities, researchers should consult the published description of data management resources and practices at that facility and reference it in the DMP. Information about other Office of Science facilities can be found at <https://science.osti.gov/user-facilities/>.
4. DMPs must protect confidentiality, personal privacy, Personally Identifiable Information, and U.S. national, homeland, and economic security; recognize proprietary interests, business confidential information, and intellectual property rights; avoid significant negative impact

on innovation, and U.S. competitiveness; and otherwise be consistent with all applicable laws, and regulations. There is no requirement to share proprietary data.

DMPs will be reviewed as part of the overall SC research proposal merit review process. Applicants are encouraged to consult the SC website for further information and suggestions for how to structure a DMP: <https://science.osti.gov/funding-opportunities/digital-data-management>

13. How to Prepare a Research and Related Budget and Justification

The following advice will improve the accuracy of your budget request:

- Funds requested for personnel (senior, key, and other) must be justified as the product of their effort on the project and their institutional base salary.
- Funds requested for fringe benefits must be calculated as the product of the requested salary and, if present, the negotiated fringe benefit rate contained in an institution’s negotiated indirect cost rate agreement.
- Funds requested for indirect costs must be calculated using the correct indirect cost base and the negotiated indirect cost rate.
- You are encouraged to include the rate agreement used in preparing a budget as a part of the budget justification.
- Do not prepare a budget justification using the expired DOE form F4260.1.

If you are proposing indirect costs and do not already have an Indirect Cost Rate Agreement with your Cognizant Federal Agency or documentation of rates accepted for estimating purposes by DOE or another Federal agency, it is recommended that you begin preparing an Indirect Cost Rate Proposal to be submitted, upon request, to the DOE contract specialist/grants management specialist who will evaluate your application if you are selected for award.

For your convenience in preparing an Indirect Cost Rate proposal, a link to applicant resources, including indirect rate model templates, has been provided below: <https://science.osti.gov/sbir/applicant-resources/grant-application/>.

Budget Fields

<p>Section A Senior/Key Person</p>	<p>For each Senior/Key Person, enter the requested information. List personnel, base salary, the number of months that person will be allocated to the project, requested salary, fringe benefits, and the total funds requested for each person. The requested salary must be the product of the base salary and the effort. Include a written narrative in the budget justification that justifies the need for requested personnel. Within the justification, explain the fringe benefit rate used if it is not the standard faculty rate.</p>
<p>Section B Other Personnel</p>	<p>List personnel, the number of months that person will be allocated to the project, requested salary fringe benefits, and the total funds requested for each person. Include a written narrative in the budget justification that fully justifies the need for requested personnel. Within the justification, provide the</p>

	number of positions being filled in each category of other personnel.
Section C Equipment	For the purpose of this budget, equipment is designated as an item of property that has an acquisition cost of \$5,000 or more and an expected service life of more than one year, unless a different threshold is specified in a negotiated Facilities and Administrative Cost Rate. (Note that this designation applies for proposal budgeting only and differs from the DOE definition of capital equipment.) List each item of equipment separately and justify each in the budget justification section. Do not aggregate items of equipment. Allowable items ordinarily will be limited to research equipment and apparatus not already available for the conduct of the work. General-purpose office equipment is not eligible for support unless primarily or exclusively used in the actual conduct of scientific research.
Section D Travel	For purposes of this section only, travel to Canada or to Mexico is considered domestic travel. In the budget justification, list each trip's destination, dates, estimated costs including transportation and subsistence, number of staff traveling, the purpose of the travel, and how it relates to the project. Indicate the basis for the cost estimate (quotes from vendors or suppliers, past experience of similar items, or some other basis). To qualify for support, attendance at meetings or conferences must enhance the investigator's capability to perform the research, plan extensions of it, or disseminate its results. Domestic travel is to be justified separately from foreign travel. Within the budget justification, detail the number of personnel planning to travel and the estimated per-traveler cost for each trip.
Section E Participant/Trainee Support Costs	If applicable, submit training support costs. Educational projects that intend to support trainees (precollege, college, graduate and post graduate) must list each trainee cost that includes stipend levels and amounts, cost of tuition for each trainee, cost of any travel (provide the same information as needed under the regular travel category), and costs for any related training expenses. Participant costs are those costs associated with conferences, workshops, symposia or institutes and breakout items should indicate the number of participants, cost for each participant, purpose of the conference, dates and places of meetings and any related administrative expenses. Indicate the basis for the cost estimate (quotes from vendors or suppliers, past experience of similar items, or some other basis).
Section F Other Direct Costs	<ul style="list-style-type: none"> • Materials and Supplies: Enter total funds requested for materials and supplies in the appropriate fields. In the budget justification, indicate general categories such as glassware, and chemicals, including an amount for each category (items not identified under "Equipment"). Categories less than \$1,000 are not required to be itemized. Indicate the basis for the cost estimate (quotes from vendors or suppliers, past experience of similar items, or some other basis). • Publication Costs: Enter the total publication funds requested.

	<p>The proposal budget may request funds for the costs of documenting, preparing, publishing or otherwise making available to others the findings and products of the work conducted under the award. In the budget justification, include supporting information. Indicate the basis for the cost estimate (quotes from vendors or suppliers, past experience of similar items, or some other basis).</p> <ul style="list-style-type: none"> • Consultant Services: Enter total funds requested for all consultant services. In the budget justification, identify each consultant, the services he/she will perform, total number of days, travel costs, and total estimated costs. Indicate the basis for the cost estimate (quotes from vendors or suppliers, past experience of similar items, or some other basis). • ADP/Computer Services: Enter total funds requested for ADP/Computer Services. Cloud computing costs must be included under this item. The cost of computer services, including computer-based retrieval of scientific, technical and education information may be requested. In the budget justification, include the established computer service rates at the proposing organization if applicable. Indicate the basis for the cost estimate (quotes from vendors or suppliers, past experience of similar items, or some other basis). • Subawards/Consortium/Contractual Costs: Enter total costs for all subawards/consortium organizations and other contractual costs proposed for the project. In the budget justification, justify the details. • Equipment or Facility Rental/User Fees: Enter total funds requested for Equipment or Facility Rental/User Fees. In the budget justification, identify each rental/user fee and justify. Indicate the basis for the cost estimate (quotes from vendors or suppliers, past experience of similar items, or some other basis). • Alterations and Renovations: Enter total funds requested for Alterations and Renovations. In the budget justification, itemize by category and justify the costs of alterations and renovations, including repairs, painting, removal or installation of partitions, shielding, or air conditioning. Where applicable, provide the square footage and costs. • Other: Add text to describe any other Direct Costs not requested above. Enter costs associated with “Other” item(s). Use the budget justification to further itemize and justify.
Section G Direct Costs	This represents Total Direct Costs (Sections A through F).
Section H Other Indirect Costs	Enter the Indirect Cost information, including the rates and bases being used, for each field. Only four general categories of indirect costs are allowed/requested on this form, so please consolidate if needed.

	Include the cognizant Federal agency and contact information if using a negotiated rate agreement. Within the budget justification, explain the use of multiple rates, if multiple rates are used.
Section I Total Direct and Indirect Costs	This is the total of Sections G and H.

14. How to Register in PAMS

After you submit your application through Grants.gov, the application will automatically transfer into the Portfolio Analysis and Management System (PAMS) for processing by the DOE SC. Many functions for grants and cooperative agreements can be done in PAMS, which is available at <https://pamspublic.science.energy.gov>.

You will want to “register to” your application: a process of linking yourself to the application after it has been submitted through Grants.gov and processed by DOE.

You must register in PAMS to submit a pre-application or a LOI.

Notifications sent from the PAMS system will come from the PAMS email address <PAMS.Autoreply@science.doe.gov>. Please make sure your email server/software allows delivery of emails from the PAMS email address to yours.

Registering to PAMS is a two-step process; once you create an individual account, you must associate yourself with (“register to”) your institution. Detailed steps are listed below.

CREATE PAMS ACCOUNT:

To register, click the “Create New PAMS Account” link on the website <https://pamspublic.science.energy.gov/>.

- Click the “No, I have never had an account” link and then the “Create Account” button.
- You will be prompted to enter your name and email address, create a username and password, and select a security question and answer. Once you have done this, click the “Save and Continue” button.
- On the next page, enter the required information (at least one phone number and your mailing address) and any optional information you wish to provide (e.g., FAX number, website, mailstop code, additional email addresses or phone numbers, Division/Department). Click the “Create Account” button.
- Read the user agreement and click the “Accept” button to indicate that you understand your responsibilities and agree to comply with the rules of behavior for PAMS.
- PAMS will take you to the “Having Trouble Logging In?” page. (If you have been an SC merit reviewer or if you have previously submitted an application, you may already be linked to an institution in PAMS. If this happens, you will be taken to the PAMS home page.)

REGISTER TO YOUR INSTITUTION:

- Click the link labeled “Option 2: I know my institution and I am here to register to the institution.” (Note: If you previously created a PAMS account but did not register to an institution at that time, you must click the Institutions tab and click the “Register to Institution” link.)
- PAMS will take you to the “Register to Institution” page.
- Type a word or phrase from your institution name in the field labeled, “Institution Name like,” choose the radio button next to the item that best describes your role in the system, and click the “Search” button. A “like” search in PAMS returns results that contain the word or phrase you enter; you do not need to enter the exact name of the institution, but you should enter a word or phrase contained within the institution name. (If your institution has a frequently used acronym, such as ANL for Argonne National Laboratory or UCLA for the Regents of the University of California, Los Angeles, you may find it easiest to search for the acronym under “Institution Name like.” Many institutions with acronyms are listed in PAMS with their acronyms in parentheses after their names.)
- Find your institution in the list that is returned by the search and click the “Actions” link in the Options column next to the institution name to obtain a dropdown list. Select “Add me to this institution” from the dropdown. PAMS will take you to the “Institutions – List” page.
- If you do not see your institution in the initial search results, you can search again by clicking the “Cancel” button, clicking the Option 2 link, and repeating the search.
- If, after searching, you think your institution is not currently in the database, click the “Cannot Find My Institution” button and enter the requested institution information into PAMS. Click the “Create Institution” button. PAMS will add the institution to the system, associate your profile with the new institution, and return you to the “Institutions – List” page when you are finished.

For help with PAMS, click the “PAMS Help” link on the PAMS website, <https://pamspublic.science.energy.gov/>. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free) or (301) 903-9610, email: sc.pams-helpdesk@science.doe.gov. All submission and inquiries about this FOA should reference the FOA number printed on the cover page.

15. How to View Applications in PAMS

Each Grants.gov application submitted to the DOE SC automatically transfers into PAMS and is subsequently assigned to a program manager. At the time of program manager assignment, the three people listed on the SF-424 (R&R) cover page will receive an email with the subject line, “Receipt of Proposal 0000xxxxxx by the DOE Office of Science.” These three people are the PI (Block 14), Authorized Representative (Block 19), and Point of Contact (Block 5). In PAMS notation, applications are known as proposals, the PI is known as the PI, the Authorized Representative is known as the Sponsored Research Officer/Business Officer/Administrative Officer (SRO/BO/AO), and the Point of Contact is known as the POC.

There will be a period of time between the application’s receipt at Grants.gov and its assignment to a DOE SC program manager. Program managers are typically assigned two weeks after applications are due at Grants.gov: please refrain from attempting to view the proposal in PAMS

until you receive an email providing the assignment of a program manager.

Once the email is sent, the PI, SRO/BO/PO, and POC will each be able to view the submitted proposal in PAMS. Viewing the proposal is optional.

Following are two sets of instructions for viewing the submitted proposal, one for individuals who already have PAMS accounts and one for those who do not.

If you already have a PAMS account, follow these instructions:

1. Log in to PAMS at <https://pamspublic.science.energy.gov/>.
2. Click the “Proposals” tab and click “Access Previously Submitted Grants.gov Proposal.”
3. Enter the following information:
 - Proposal ID: Enter the ten-digit PAMS proposal ID, including the leading zeros (e.g., 00002xxxxx). Do not use the Grants.gov proposal number. Use the PAMS number previously sent to you in the email with subject line, “Receipt of Proposal ...”.
 - Email (as entered in Grants.gov application): Enter your email address as it appears on the SF424(R&R) Cover Page.
 - Choose Role: Select the radio button in front of the role corresponding to the SF-424 (R&R) cover page. If your name appears in block 19 of the SF-424 (R&R) cover page as the authorizing representative, select “SRO/BO/AO (Sponsored Research Officer/Business Officer/Administrative Officer).” If your name appears in block 14 of the SF424 R&R cover page as the PI, select “Principal Investigator (PI).” If your name appears in block 5 of the SF424 R&R as the point of contact, select “Other (POC).”
4. Click the “Save and Continue” button. You will be taken to your “My Proposals” page. The Grants.gov proposal will now appear in your list of proposals. Click the “Actions/Views” link in the options column next to this proposal to obtain a dropdown list. Select “Proposal” from the dropdown to see the proposal. Note that the steps above will work only for proposals submitted to the DOE SC since May 2012.

If you do not already have a PAMS account, follow these instructions:

1. To register, click the “Create New PAMS Account” link on the website <https://pamspublic.science.energy.gov/>.
2. Click the “No, I have never had an account” link and then the “Create Account” button.
3. You will be prompted to enter your name and email address, create a username and password, and select a security question and answer. Once you have done this, click the “Save and Continue” button.
4. On the next page, enter the required information (at least one phone number and your mailing address) and any optional information you wish to provide (e.g., FAX number, website, mailstop code, additional email addresses or phone numbers, Division/Department). Click the “Create Account” button.
5. Read the user agreement and click the “Accept” button to indicate that you understand your responsibilities and agree to comply with the rules of behavior for PAMS.
6. You will be taken to the Register to Institution page. Select the link labeled, “Option 1: My institution has submitted a proposal in Grants.gov. I am here to register as an SRO, PI, or POC (Sponsored Research Officer, Principal Investigator, or Point of Contact).”
7. Enter the following information:

- Proposal ID: Enter the ten-digit PAMS proposal ID, including the leading zeros (e.g., 00002xxxxx). Do not use the Grants.gov proposal number. Use the PAMS number previously sent to you in the email with subject line, “Receipt of Proposal ...”.
 - Email (as entered in Grants.gov proposal): Enter your email address as it appears on the SF424(R&R) Cover Page.
 - Choose Role: Select the radio button in front of the role corresponding to the SF-424 (R&R) cover page. If your name appears in block 19 of the SF-424 (R&R) cover page as the authorizing representative, select “SRO/BO/AO (Sponsored Research Officer/Business Officer/Administrative Officer).” If your name appears in block 14 of the SF424 R&R cover page as the PI, select “Principal Investigator (PI).” If your name appears in block 5 of the SF424 R&R as the point of contact, select “Other (POC).”
8. Click the “Save and Continue” button. You will be taken to your “My Proposals” page. The Grants.gov proposal will now appear in your list of proposals. Click the “Actions/Views” link in the options column next to this proposal to obtain a dropdown list. Select “Proposal” from the dropdown to see the proposal.

If you were listed as the PI on a prior submission but you have not previously created an account, you may already be listed in PAMS. If this is the case, you will be taken to the PAMS home page after agreeing to the Rules of Behavior. If that happens, follow the instructions listed above under “If you already have a PAMS account...” to access your Grants.gov proposal.

16. How to Register in Other Systems Before Submitting an Application

SYSTEMS TO REGISTER IN

Applicants must complete a series of registrations and enrollments to submit applications in response to this FOA. Applicants not currently registered with SAM and Grants.gov should allow **at least four weeks** to complete these requirements.

You should start the process as soon as possible.

You may not be able to use your preferred Internet browser: Each system has its own requirements.

Applicants must register with SAM at <https://www.sam.gov/> and obtain a Unique Entity Identifier (UEI). Assistance is available at <https://sam.gov/content/help>.

If entities have technical difficulties with the UEI validation or SAM registration process, they should utilize the HELP feature on SAM.gov. SAM.gov will work entity service tickets in the order in which they are received and asks that entities not create multiple service tickets for the same request or technical issue.

Applicants must provide a Taxpayer Identification Number (TIN) to complete their registration in www.SAM.gov. An applicant’s TIN is an EIN assigned by the Internal Revenue Service (IRS). In limited circumstances, a Social Security Number (SSN) assigned by the Social Security Administration (SSA) may be used as a TIN. You may obtain an EIN from the IRS at

<https://www.irs.gov/businesses/small-businesses-self-employed/apply-for-an-employer-identification-number-ein-online>.

Do not use a SSN as a TIN.

Obtain a TIN from the IRS using the website listed above.

Applicants must register with FedConnect at www.FedConnect.net. The full, binding version of assistance agreements will be posted to FedConnect.

Recipients must register with the Federal Funding Accountability and Transparency Act Subaward Reporting System at <https://www.fsr.gov>. This registration must be completed before an award may be made: you are advised to register while preparing your application.

REGISTERING IN GRANTS.GOV

Applicants must register with Grants.gov, following the instructions at <https://www.Grants.gov/web/grants/applicants/registration.html> and described above.

WHERE TO SUBMIT AN APPLICATION

You must submit the application through Grants.gov at www.Grants.gov, using either the online webforms or downloaded forms, or a system-to-system service

Submit electronic applications through the “Apply for Grants” function at www.Grants.gov. If you have problems completing the registration process or submitting your application, call Grants.gov at 1-800-518-4726 or send an email to support@Grants.gov.

Please ensure that you have read the applicable instructions, guides, help notices, frequently asked questions, and other forms of technical support on Grants.gov.

DOE SC PORTFOLIO ANALYSIS AND MANAGEMENT SYSTEM (PAMS)

Applicants must register in the Portfolio Analysis and Management System (PAMS) to submit letters of intent and pre-applications, to view merit reviewer comments, or to take a number of post-award actions.

B. POLICY PROVISIONS

1. Evaluation and Administration by Non-Federal Personnel

In conducting the merit review evaluation, the Government may seek the advice of qualified non-Federal personnel as reviewers. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The applicant, by submitting its application, consents to the use of non-Federal reviewers/administrators. Non-Federal reviewers must sign a conflict-of-interest agreement and a certificate of confidentiality prior to reviewing an application. Non-Federal personnel conducting administrative activities must sign a non-disclosure agreement.

2. Government Right to Reject or Negotiate

DOE reserves the right, without qualification, to reject any or all applications received in response to this FOA and to select any application, in whole or in part, as a basis for negotiation and/or award.

3. Intergovernmental Review

This program is not subject to Executive Order 12372 Intergovernmental Review of Federal Programs.

4. Modifications

Notices of any modifications to this FOA will be posted on Grants.gov and the FedConnect portal. You can receive an email when a modification or an FOA message is posted by registering with FedConnect as an interested party for this FOA. It is recommended that you register as soon after release of the FOA as possible to ensure you receive timely notice of any modifications or other FOAs. More information is available at www.FedConnect.net.

C. ADMINISTRATIVE AND NATIONAL POLICY REQUIREMENTS

1. Administrative Requirements

The administrative requirements for DOE grants and cooperative agreements are contained in 2 CFR 200 as modified by 2 CFR 910 (DOE Financial Assistance Regulations).

2. Availability of Funds

Funds are not presently available for this award. The Government's obligation under this award is contingent upon the availability of appropriated funds from which payment for award purposes can be made. No legal liability on the part of the Government for any payment may arise until funds are made available to the DOE Contracting Officer for this award and until the awardee receives notice of such availability, to be confirmed in writing by the DOE Contracting Officer.

3. Buy America Requirement for Infrastructure Projects

Required use of Iron, Steel, Manufacture Products, and Construction Materials Produced in the United States

A. DEFINITIONS

For purposes of the Buy America Requirement, the following definitions apply:

Components are defined as the articles, materials, or supplies incorporated directly into the end manufactured product(s).

Construction Materials are an article, material, or supply—other than an item primarily of iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives—that is used in an infrastructure project and is or consists primarily of non-ferrous metals, plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables), glass (including optic glass), lumber, drywall, coatings (paints and stains), optical fiber, clay brick; composite building materials; or engineered wood products.

Domestic Content Procurement Preference Requirement – means a requirement that no amounts made available through a program for federal financial assistance may be obligated for an infrastructure project unless—

- (A) all iron and steel used in the project are produced in the United States;
- (B) the manufactured products used in the project are produced in the United States; or
- (C) the construction materials used in the project are produced in the United States.

Also referred to as the **Buy America Requirement**.

Infrastructure includes, at a minimum, the structures, facilities, and equipment located in the United States, for: roads, highways, and bridges; public transportation; dams, ports, harbors, and other maritime facilities; intercity passenger and freight railroads; freight and intermodal

facilities; airports; water systems, including drinking water and wastewater systems; electrical transmission facilities and systems; utilities; broadband infrastructure; and buildings and real property; and generation, transportation, and distribution of energy—including electric vehicle (EV) charging.

The term “infrastructure” should be interpreted broadly, and the definition provided above should be considered as illustrative and not exhaustive.

Manufactured Products are items used for an infrastructure project made up of components that are not primarily of iron or steel; construction materials; cement and cementitious materials’ aggregates such as stone, sand, or gravel; or aggregate binding agents or additives.

Primarily of iron or steel means greater than 50% iron or steel, measured by cost.

Project – means the construction, alteration, maintenance, or repair of infrastructure in the United States.

Public – The Buy America Requirement does not apply to non-public infrastructure. For purposes of this guidance, infrastructure should be considered “public” if it is: (1) publicly owned or (2) privately owned but utilized primarily for a public purpose. Infrastructure should be considered to be “utilized primarily for a public purpose” if it is privately operated on behalf of the public or is a place of public accommodation.

B. BUY AMERICA REQUIREMENT FOR INFRASTRUCTURE PROJECTS (BUY AMERICA REQUIREMENT)

None of the award funds (includes federal share and Recipient cost share) may be used for a project for infrastructure unless:

- (1) all iron and steel used in the project is produced in the United States—this means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States;
- (2) all manufactured products used in the project are produced in the United States—this means the manufactured product was manufactured in the United States; and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation; and
- (3) all construction materials²² are manufactured in the United States—this means that all manufacturing processes for the construction material occurred in the United States.

The Buy America Requirement only apply to articles, materials, and supplies that are consumed in, incorporated into, or affixed to an infrastructure project. As such, it does not apply to tools,

²² Excludes cement and cementitious materials, aggregates such as stone, sand, or gravel, or aggregate binding agents or additives.

equipment, and supplies, such as temporary scaffolding, brought to the construction site and removed at or before the completion of the infrastructure project. Nor does the Buy America Requirement apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished infrastructure project but are not an integral part of the structure or permanently affixed to the infrastructure project.

The Buy America Requirement does not statutorily apply to Prime Recipients that are For-Profit Entities. However, the Buy America Requirement is applicable to a For-Profit Entity if: (1) it is a sub-recipient or sub-awardee under an award that contains the Buy America Requirement term and condition, or (2) it is the Prime Recipient that voluntarily chooses to use domestically sourced iron, steel, manufactured products, and construction materials by stating so in its proposed application containing an infrastructure project. If the For-Profit Entity specifically states that it will comply with the Buy America Requirements in its application and it is selected for award, its award will contain a Buy America Requirement for Infrastructure Projects term and condition.

The Prime Recipient is responsible for flowing the Buy America Requirement down to all sub-awards, all contracts, subcontracts, and purchase orders for work performed under the proposed infrastructure project, including to For-Profit Entities when the For-Profit Entity is a sub-recipient or sub-awardee.

Recipients must certify or provide equivalent documentation for proof of compliance that a good faith effort was made to solicit bids for domestic products used in the infrastructure project under this award.

Recipients must also maintain certifications or equivalent documentation for proof of compliance that those articles, materials, and supplies that are consumed in, incorporated into, affixed to, or otherwise used in the infrastructure project, not covered by a waiver or exemption, are produced in the United States. The certification or proof of compliance must be provided by the suppliers or manufacturers of the iron, steel, manufactured products and construction materials and flow up from all subawardees, contractors and vendors to the recipient. Recipients must keep these certifications with the award/project files and be able to produce them upon request from DOE, auditors or Office of Inspector General.

C. DOE SUBMISSION REQUIREMENTS FOR FULL APPLICATION

Within the first two pages of the workplan or project description, applicants must provide a short statement on whether the project will involve the construction, alteration, maintenance and/or repair of infrastructure in the United States. The ultimate determination about whether a project includes infrastructure remains with DOE, but the applicant's statement will assist project planning and integration of the Buy America Requirement, which may impact the project's proposed budget and/or schedule.

D. WAIVERS

In limited circumstances, DOE may waive the application of the Buy America Requirement in an

award where DOE determines that:

- (1) applying the Buy America requirements would be inconsistent with the public interest (Public Interest);
- (2) the types of iron, steel, manufactured products, or construction materials are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality (Non-Availability); or
- (3) the inclusion of iron, steel, manufactured products, or construction materials produced in the United States will increase the cost of the overall project by more than 25 percent (Unreasonable Cost).

DOE will only process waiver requests after an award has been made and for which the requests have been submitted in accordance with the term and conditions of the award. Waiver requests must be reviewed by DOE and the Office of Management and Budget's Made in America Office and are subject to a public comment period of no less than 15 calendar days.

DOE or OMB may request additional information for consideration of the waiver. DOE may reject or grant waivers in whole or in part depending on its review, analysis, and/or feedback from OMB or the public. DOE's final determination regarding approval or rejection of the waiver request may not be appealed by a Recipient.

Requests to waive the Buy America Requirement must include the following:

- Waiver type (Public Interest, Non-Availability, or Unreasonable Cost);
- Recipient name and Unique Entity Identifier (UEI);
- Award information (Federal Award Identification Number, Assistance Listing number);
- A brief description of the project, its location, and the specific infrastructure involved;
- Total estimated project cost, with estimated federal share and recipient cost share breakdowns;
- Total estimated infrastructure costs, with estimated federal share and recipient cost share breakdowns;
- List and description of iron or steel item(s), manufactured goods, and/or construction material(s) the recipient seeks to waive from the Buy America Requirement, including name, cost, quantity(ies), country(ies) of origin, and relevant Product Service Codes (PSC) and North American Industry Classification System (NAICS) codes for each;
- A detailed justification as to how the non-domestic item(s) is/are essential to the project;
- A certification that the recipient made a good faith effort to solicit bids for domestic products supported by terms included in requests for proposals, contracts, and non-proprietary communications with potential suppliers;
- A justification statement—based on one of the applicable justifications outlined above—as to why the listed items cannot be procured domestically, including the due diligence performed (e.g., market research, industry outreach, cost analysis, cost-benefit analysis) by the recipient to attempt to avoid the need for a waiver. This justification may cite, if applicable, the absence of any Buy America-compliant bids received for domestic products in response to a solicitation; and
- Anticipated impact to the project if no waiver is issued.

The following principles should be incorporated as minimum requirements in waiver request:

- **Time-limited:** Consider a waiver constrained principally by a length of time, rather than by the specific project/award to which it applies. Waivers of this type may be appropriate, for example, when an item that is “non-available” is widely used in the project. When requesting such a waiver, the recipient should identify a reasonable, definite time frame (e.g., no more than one to two years) designed so that the waiver is reviewed to ensure the condition for the waiver (“non-availability”) has not changed (e.g., domestic supplies have become more available).
- **Targeted:** Waiver requests should apply only to the item(s), product(s), or material(s) or category(ies) of item(s), product(s), or material(s) as necessary and justified. Waivers should not be overly broad as this will undermine domestic preference policies.
- **Conditional:** The recipient may request a waiver with specific conditions that support the policies of IJJA/BABA and Executive Order 14017.

4. Conference Spending (February 2015)

The recipient shall not expend any funds on a conference not directly and programmatically related to the purpose for which the grant or cooperative agreement was awarded that would defray the cost to the United States Government of a conference held by any Executive branch department, agency, board, commission, or office for which the cost to the United States Government would otherwise exceed \$20,000, thereby circumventing the required notification by the head of any such Executive Branch department, agency, board, commission, or office to the Inspector General (or senior ethics official for any entity without an Inspector General), of the date, location, and number of employees attending such conference.

5. Commitment of Public Funds

(a) A DOE financial assistance award is valid only if it is in writing and is signed, either in writing or electronically, by a DOE Contracting Officer.

(b) Recipients are free to accept or reject the award. A request to draw down DOE funds constitutes the Recipient’s acceptance of the terms and conditions of this Award.

6. Corporate Felony Conviction and Federal Tax Liability Representations (March 2014)

In submitting an application in response to this FOA the Applicant represents that:

- It is **not** a corporation that has been convicted of a felony criminal violation under any Federal law within the preceding 24 months,
- It is **not** a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

For purposes of these representations the following definitions apply:

- A Corporation includes any entity that has filed articles of incorporation in any of the 50 states, the District of Columbia, or the various territories of the United States [but not foreign corporations]. It includes both for-profit and non-profit organizations.

7. Environmental, Safety and Health (ES&H) Performance of Work at DOE Facilities

With respect to the performance of any portion of the work under this award which is performed at a DOE-owned or controlled site, the recipient agrees to comply with all state and Federal ES&H regulations, and with all other ES&H requirements of the operator of such site.

Prior to the performance on any work at a DOE-owned or controlled site, the recipient shall contact the site facility manager for information on DOE and site-specific ES&H requirements.

The recipient shall apply this provision to all subrecipients at any tier.

8. Federal, State, and Local Requirements

With respect to the performance of any portion of the work under this award, the recipient agrees to comply with all applicable local, state, and Federal ES&H regulations. The recipient shall apply this provision to all sub awardees at any tier.

9. Funding Restrictions

Funding for all awards and future budget periods are contingent upon the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority.

Cost Principles: Costs must be allowable, allocable and reasonable in accordance with the applicable Federal cost principles referenced in 2 CFR 200 as modified by 2 CFR 910 (DOE Financial Assistance Regulation).

Pre-award Costs: Recipients may charge to an award resulting from this FOA pre-award costs that were incurred within the 90-day calendar period immediately preceding the effective date of the award, if the costs are allowable in accordance with the applicable Federal cost principles referenced in 2 CFR 200 as modified by 2 CFR 910 (DOE Financial Assistance Regulation). Recipients must obtain the prior approval of the DOE Contracting Officer for any pre-award costs that are for periods greater than this 90-day calendar period.

Pre-award costs are incurred at the applicant's risk. DOE is under no obligation to reimburse such costs if for any reason the applicant does not receive an award or if the award is made for a lesser amount than the applicant expected.

10. National Environmental Policy Act (NEPA) Compliance

If question 4.a. on the "Research and Related Other Project Information" document indicates "potential impact on the environment", or if DOE's own review indicates it, DOE may ask the

applicant to provide additional information on those impacts in order to prepare an environmental critique/synopsis per 10 CFR 1021.216. Note that this pre-award environmental critique/synopsis process would be separate from the preparation of a NEPA document such as an environmental impact statement (EIS) or an environmental assessment (EA). If DOE determines the latter documentation is necessary, this process would need to be completed, funded by and with the participation of the awardee, prior to them taking any action on the proposed project that could have adverse environmental effects or that could limit the choice of reasonable alternatives. Note that in most cases, even when “Potential Impact to the Environment” is checked “Yes,” preparation of such NEPA documents is rarely necessary, but DOE has the expectation that the Applicant will disclose the potential, which would serve to initiate dialog with DOE if necessary. The inability to satisfy the NEPA requirements after an award would result in cancellation of the award.

11. Nondisclosure and Confidentiality Agreements Representations (June 2015)

In submitting an application in response to this FOA the Applicant represents that:

(1) It **does not and will not** require its employees or contractors to sign internal nondisclosure or confidentiality agreements or statements prohibiting or otherwise restricting its employees or contractors from lawfully reporting waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

(2) It **does not and will not** use any Federal funds to implement or enforce any nondisclosure and/or confidentiality policy, form, or agreement it uses unless it contains the following provisions:

a. *“These provisions are consistent with and do not supersede, conflict with, or otherwise alter the employee obligations, rights, or liabilities created by existing statute or Executive order relating to (1) classified information, (2) communications to Congress, (3) the reporting to an Inspector General of a violation of any law, rule, or regulation, or mismanagement, a gross waste of funds, an abuse of authority, or a substantial and specific danger to public health or safety, or (4) any other whistleblower protection. The definitions, requirements, obligations, rights, sanctions, and liabilities created by controlling Executive orders and statutory provisions are incorporated into this agreement and are controlling.”*

b. The limitation above shall not contravene requirements applicable to Standard Form 312, Form 4414, or any other form issued by a Federal department or agency governing the nondisclosure of classified information.

c. Notwithstanding provision listed in paragraph (a), a nondisclosure or confidentiality policy form or agreement that is to be executed by a person connected with the conduct of an intelligence or intelligence-related activity, other than an employee or officer of the United States Government, may contain provisions appropriate to the particular activity for which such document is to be used. Such form or agreement shall, at a minimum, require that the person will not disclose any classified information received in the course of such activity unless specifically authorized to do so by the United States Government. Such nondisclosure or confidentiality forms shall also make it clear that they do not bar disclosures to Congress, or to an authorized official of an executive agency or the Department of Justice, that are essential to reporting a substantial violation of law.

12. Notice Regarding Eligible/Ineligible Activities

Eligible activities under this program include those which describe and promote the understanding of scientific and technical aspects of specific energy technologies, but not those which encourage or support political activities such as the collection and dissemination of information related to potential, planned or pending legislation.

13. Prohibition on Discrimination and Harassment

All people conducting, supporting, or participating in scientific research under this award must be able to do so on the basis of their abilities and without any unnecessary barriers. Recipients of awards resulting from this FOA are prohibited from engaging in discrimination on any basis prohibited by law, including harassment (sexual or non-sexual) as contained in 10 CFR 1040, 1041, and 1042.

Recipients may contact the DOE's Office of Civil Rights for technical assistance in meeting their institutional requirements under these regulations, including assistance in addressing complaints of discrimination or harassment (<https://www.energy.gov/diversity/title-ix>). The United States Equal Employment Opportunity Commission also makes a number of resources available at <https://www.eeoc.gov/eeoc/publications/index.cfm> to ensure that employees may perform their work without hindrance. Graduate students and post-doctoral researchers are understood to have a dual role as both trainees and employees, in accordance with 2 CFR 200.400 (f).

14. Prohibition on Lobbying Activity

By accepting funds under this award, you agree that none of the funds obligated on the award shall be expended, directly or indirectly, to influence congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 USC 1913. This restriction is in addition to those prescribed elsewhere in statute and regulation.

15. Proprietary Application Information

Patentable ideas, trade secrets, proprietary or confidential commercial or financial information, disclosure of which may harm the applicant, should be included in an application only when such information is necessary to convey an understanding of the proposed project. The use and disclosure of such data may be restricted, provided the applicant includes the following legend on the first page of any document included in the application that contains such proprietary information and specifies the pages of the document which are to be restricted:

“The data contained in pages _____ of this document have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes, provided that if this applicant receives an award as a result of or in connection with the submission of this application, DOE shall have the right to use or disclose the data herein to the extent provided in the award. This restriction does not limit the

government’s right to use or disclose data obtained without restriction from any source, including the applicant.”

To protect such data, each line or paragraph on the pages containing such data must be specifically identified and marked with a legend similar to the following:

“The following contains proprietary information that (name of applicant) requests not be released to persons outside the Government, except for purposes of review and evaluation.”

16. Publications

The recipient is expected to publish or otherwise make publicly available the results of the work conducted under any award resulting from this FOA. Publications and other methods of public communication describing any work based on or developed under an award resulting from this FOA must contain an acknowledgment of SC support. The format for such acknowledgments is provided at <https://science.osti.gov/funding-opportunities/acknowledgements/>. The author’s copy of any peer-reviewed manuscript accepted for publication must be announced to DOE’s Office of Scientific and Technical Information (OSTI) and made publicly available in accordance with the instructions contained in the Reporting Requirements Checklist incorporated in all Assistance Agreements.

17. Registration Requirements

Additional administrative requirements for DOE grants and cooperative agreements are contained in 2 CFR 25 (See: www.eCFR.gov). Prime awardees must keep their data in SAM current at www.SAM.gov. Subrecipients at all tiers must obtain UEI numbers and provide the UEI to the prime awardee before the subaward can be issued.

18. Research Misconduct

Scientific discoveries can only take place when scientific research is conducted in a fair, transparent, and honestly reported manner. Any form of dishonesty—whether plagiarism, falsifying results, or misrepresenting conditions—makes it impossible to advance our understanding of the physical universe.

Recipients are “responsible for maintaining the integrity of research of any kind under an award from DOE including the prevention, detection, and remediation of research misconduct, and the conduct of inquiries, investigations, and adjudication of allegations of research misconduct,” and conducting appropriate administrative processes in response to allegations of research misconduct in accordance with 2 CFR 910.132. Allegations of any misconduct under an award resulting from this FOA must be reported to the appropriate institutional officials in accordance with institutional policies against misconduct. Additional information on DOE research misconduct policies can be found at: <https://science.osti.gov/grants/Policy-and-Guidance/Research-Misconduct>.

19. Rights in Technical Data

Normally, the government has unlimited rights in technical data created under a DOE agreement, including the right to distribute to the public. Delivery or third party licensing of proprietary software or data developed solely at private expense (“Limited Rights Data”) will not normally be required except as specifically negotiated in a particular agreement to satisfy DOE’s own needs or to insure the commercialization of technology developed under a DOE agreement.

If software is specified for delivery to DOE, or if other special circumstances exist, e.g., DOE specifying “open-source” treatment of software, then the DOE Contracting Officer, after negotiation with the recipient, may include in the award special provisions requiring the recipient to obtain written approval of the DOE Contracting Officer prior to asserting copyright in the software, modifying the retained Government license, and/or otherwise altering the copyright provisions.

20. Subaward and Executive Reporting

Additional administrative requirements necessary for DOE grants and cooperative agreements to comply with the Federal Funding and Transparency Act of 2006 (FFATA) are contained in 2 CFR 170. (See: www.eCFR.gov). Prime awardees must register with the new FSRs database at <https://www.fsr.gov> and report the required data on their first tier subrecipients. Prime awardees must report the executive compensation for their own executives as part of their registration profile in SAM.

21. Title to Subject Inventions

Ownership of subject inventions is governed pursuant to the authorities listed below:

- **Nonprofit organizations or small business firms:** Under the Bayh-Dole Act (35 U.S.C. § 200 et seq.), nonprofit organizations or small business firms as defined by 35 U.S.C. 201 may elect to retain title to their subject inventions.
- **All other parties:** The federal Non-Nuclear Energy Act of 1974, 42. U.S.C. 5908, provides that the government obtains title to new inventions unless a waiver is granted (see below).
- **Patent Waiver:** DOE has issued Class Patent Waiver W(C) 2022-01 which allows domestic large businesses providing at least 20% cost share to elect to retain title to their subject inventions. Class Patent Waiver W(C) 2022-01 includes a U.S. Competitiveness provision requiring any products embodying or produced through the use of a subject invention first created or reduced to practice in the performance of work under this FOA to be substantially manufactured in the United States. A domestic large business is any for-profit entity that does not qualify as a “small business” and is incorporated (or otherwise formed) under the laws of a particular state or territory of the United States and is not owned, controlled, or influenced by a foreign government, agency, firm, corporation, or person. Applicants may request a waiver of all or any part of the rights of the United States in inventions conceived or first actually reduced to practice in performance of an agreement as a result of this FOA, in advance of or within 30 days after the effective date of the award. Even if such advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver of the rights of the United States in identified inventions, i.e., individual inventions conceived or first actually reduced to practice in performance of

the award. Any patent waiver that may be granted is subject to certain terms and conditions in 10 CFR 784. For more information, see <https://energy.gov/gc/services/technology-transfer-and-procurement/office-assistant-general-counsel-technology-transf-1> . Nonprofit organizations and small business firms do not need a patent waiver in order to retain title to their subject inventions (see above).

- **Determination of Exceptional Circumstances (DEC):** On June 07, 2021, DOE approved a DETERMINATION OF EXCEPTIONAL CIRCUMSTANCES (DEC) UNDER THE BAYH-DOLE ACT TO FURTHER PROMOTE DOMESTIC MANUFACTURE OF DOE SCIENCE AND ENERGY TECHNOLOGIES. In accordance with this DEC, all awards, including sub-awards, under this FOA shall include the U.S. Competitiveness Provision in accordance with [Section VIII](#) of this FOA. A copy of the DEC can be found at <https://www.energy.gov/gc/determination-exceptional-circumstances-decs>.
- Pursuant to 37 CFR § 401.4, any nonprofit organization or small business firm as defined by 35 U.S.C. 201 affected by any DEC has the right to appeal it by providing written notice to DOE within 30 working days from the time it receives a copy of the determination.
- DOE may issue and publish on the website above further DEC's prior to the issuance of awards under this FOA. DOE may require additional submissions or requirements as authorized by any applicable DEC.
- **[IF APPLICABLE] DEC: QUANTUM INFORMATION SCIENCE TECHNOLOGIES DEC:** On August 28, 2020, DOE approved a DETERMINATION OF EXCEPTIONAL CIRCUMSTANCES UNDER THE BAYH-DOLE ACT FOR QUANTUM INFORMATION SCIENCE TECHNOLOGIES, pursuant to 37 CFR 401.3(a)(2), which applies to agreements issued under this FOA requiring each applicant to agree to a U.S. Competitiveness Provision. DOE has determined that exceptional circumstances exist that warrant the modification of the standard patent rights clause for small businesses and non-profit awardees under the Bayh-Dole Act, 35 U.S.C. 200 et seq., to the extent necessary to ensure that DOE “obtains sufficient rights in the federally supported inventions to meet the needs of [DOE]” and “to promote the commercialization and public availability of inventions made in the United States by United States industry and labor” and/or further promote other purposes of the Bayh-Dole Act. 35 U.S.C. § 200. In accordance with this DEC, all awards, including sub-awards, under this FOA shall include the U.S. Competitiveness Provision in accordance with [Section VIII](#) of this FOA. A copy of the DEC can be found at <https://www.energy.gov/gc/determination-exceptional-circumstances-decs>.

[IF APPLICABLE] Class Patent Waiver: DOE has issued Class Patent Waiver No. W(C) 2020-001 of Patent Rights Related to Quantum Information Science and its Technology Applications that applies to this FOA for any domestic large business that is a recipient, or subrecipient at any tier to this FOA and is providing at least 20% cost share. Under this Class Patent Waiver, domestic large businesses may elect title to their subject inventions similar to the right provided to the domestic small businesses, educational institutions, and nonprofits by law. In order to avail itself of the class patent waiver, a domestic large business must agree that any products embodying or produced through the use of a subject invention first created or reduced to practice under this program will be substantially manufactured in the United States. Entities not eligible under the Class Patent Waiver are still able to petition DOE for rights under an Advanced or Identified Patent Waiver as described above.

Nonprofit organizations and small business firms do not need a patent waiver in order to retain title to their subject inventions (see above).

22. U.S. Competitiveness

A primary objective of DOE's multi-billion dollar research, development and demonstration investments is to cultivate new research and development ecosystems, manufacturing capabilities, and supply chains for and by U.S. industry and labor. Therefore, in exchange for receiving taxpayer dollars to support an applicant's project, the applicant must agree to a U.S. Competitiveness provision requiring that any products embodying any subject invention or produced through the use of any subject invention will be manufactured substantially in the United States unless the Recipient can show to the satisfaction of DOE that it is not commercially feasible. Award terms, including the U.S. Competitiveness Provision, are available at <https://www.energy.gov/gc/standard-intellectual-property-ip-provisions-financial-assistance-awards>.

Please note that a subject invention is any invention conceived or first actually reduced in performance of work under an award. An invention is any invention or discovery which is or may be patentable. The recipient includes any awardee, recipient, sub-awardee, or sub-recipient.

As noted in the U.S. Competitiveness Provision, if an entity cannot meet the requirements of the U.S. Competitiveness Provision, the entity may request a modification or waiver of the U.S. Competitiveness Provision. For example, the entity may propose modifying the language of the U.S. Competitiveness Provision in order to change the scope of the requirements or to provide more specifics on the application of the requirements for a particular technology. As another example, the entity may request that the U.S. Competitiveness Provision be waived in lieu of a net benefits statement or U.S. manufacturing plan. The statement or plan would contain specific and enforceable commitments that would be beneficial to the U.S. economy and competitiveness. Examples of such commitments could include manufacturing specific products in the U.S., making a specific investment in a new or existing U.S. manufacturing facility, keeping certain activities based in the U.S. or supporting a certain number of jobs in the U.S. related to the technology. DOE may, in its sole discretion, determine that the proposed modification or waiver promotes commercialization and provides sufficient U.S. economic benefits, and grant the request. If granted, DOE will modify the award terms and conditions for the requesting entity accordingly. More information and guidance on the waiver and modification request process can be found in the DOE Financial Assistance Letter on this topic, available here at <https://www.energy.gov/management/pf-2022-09-fal-2022-01-implementation-doe-determination-exceptional-circumstances-under>. Additional information on DOE's Commitment to Domestic Manufacturing for DOE-funded R&D is available at <https://www.energy.gov/gc/us-manufacturing>.

The U.S. Competitiveness Provision is implemented by DOE pursuant to a Determination of Exceptional Circumstances (DEC) under the Bayh-Dole Act and DOE Patent Waivers. See [Section VIII](#).

D. REFERENCE MATERIAL

Glossary of Useful Grants and Cooperative Agreement terms

Acquisition cost	<i>Acquisition cost</i> means the cost of the asset including the cost to ready the asset for its intended use. Acquisition cost for equipment, for example, means the net invoice price of the equipment, including the cost of any modifications, attachments, accessories, or auxiliary apparatus necessary to make it usable for the purpose for which it is acquired. Acquisition costs for software includes those development costs capitalized in accordance with generally accepted accounting principles (GAAP). Ancillary charges, such as taxes, duty, protective in transit insurance, freight, and installation may be included in or excluded from the acquisition cost in accordance with the non-Federal entity's regular accounting practices.
Administrative requirements	<i>Administrative requirements</i> means the general business management practices that are common to the administration of all grants, such as financial accountability, reporting, equipment management, and retention of records.
Advance payment	<i>Advance payment</i> means a payment that a Federal awarding agency or pass-through entity makes by any appropriate payment mechanism, including a predetermined payment schedule, before the non-Federal entity disburses the funds for program purposes.
Allocation	<i>Allocation</i> means the process of assigning a cost, or a group of costs, to one or more cost objective(s), in reasonable proportion to the benefit provided or other equitable relationship. The process may entail assigning a cost(s) directly to a final cost objective or through one or more intermediate cost objectives.
Allocability	<i>Allocability</i> means the principle which requires that an expense or service charged must directly benefit and be necessary for the performance of the project; when multiple projects are benefited reasonable proportions must be able to be assigned. See 2 CFR 200.405.
Allowable cost	<i>Allowable cost</i> means a cost incurred by a recipient that is: (1) reasonable for the performance of the award; (2) allocable; (3) in conformance with any limitations or exclusions set forth in the Federal cost principles applicable to the organization incurring the cost or in the award documents as to the type or amount of cost; (4) consistent with regulations, policies, and procedures of the recipient that are applied uniformly to both federally supported and other activities of the organization; (5) accorded consistent treatment as a direct or indirect cost; (6) determined in accordance with generally accepted accounting principles; and (7) not included as a cost in any other federally supported award (unless specifically authorized by statute). See 2 CFR 200.403.
Application	<i>Application</i> means a request for financial support of a project or activity submitted to DOE on specified forms and in accordance with DOE instructions. Also known as a proposal.
Appropriation Act	<i>Appropriation act</i> means the statute that provides the authority for Federal agencies to incur obligations to and make payments out of the U.S. treasury for specified purposes.
Approved budget	The <i>approved budget</i> for the Federal award summarizes the financial aspects of the project or program as approved during the Federal award process. It may include either the Federal and non-Federal share or only the Federal share, depending upon Federal awarding agency requirements. It must be related to performance for program evaluation purposes whenever appropriate. See 2 CFR 200.308(a).
Assurance	<i>Assurance</i> means a certification by an applicant, normally included with the application or State plan, indicating that the entity is in compliance with, or that it will abide by, a particular requirement if awarded a Federal grant.

Authorized organizational representative	<i>Authorized organizational representative</i> means the individual, named by the applicant organization, who is authorized to act for the applicant and to assume the obligations imposed by the Federal laws, regulations, requirements, and conditions that apply to grant applications or grant awards.
Award	<i>Award</i> means the provision of funds by DOE, based on an approved application and budget or progress report, to an organizational entity or an individual to carry out a project or activity.
Award documents	<i>Award documents</i> means the entirety of the documents describing the legal relationship between DOE and an awardee or recipient. The award documents include an Assistance Agreement and other documents which may be incorporated by reference or as attachments to the Assistance Agreement. The award documents are the official, legally binding document, signed (or the electronic equivalent of signature) by a Contracting Officer that: <ul style="list-style-type: none"> • notifies the recipient of the award of a grant; • contains or references all the terms and conditions of the grant and Federal funding limits and obligations; and, • provides the documentary basis for recording the obligation of Federal funds in the DOE accounting system.
Bayh-Dole Act	<i>Bayh-Dole Act</i> means a law which encourages universities and researchers to develop their inventions into marketable products; formal citation is Section 6 of the Patent and Trademark Amendment of 1980, Pub. L 96-517 as amended.
Budget	<i>Budget</i> means the financial plan for the project or program that the Federal awarding agency or pass-through entity approves during the Federal award process or in subsequent amendments to the Federal award. It may include the Federal and non-Federal share or only the Federal share, as determined by the Federal awarding agency or pass-through entity.
Budget period	<i>Budget period</i> means the intervals of time (usually 12 months each) into which a project period is divided for budgetary and funding purposes.
Business officer	<i>Business officer</i> means the financial official of the recipient who has primary fiscal responsibility for the grant. Also known as authorized organizational representative.
Capital assets	<i>Capital assets</i> means tangible or intangible assets used in operations having a useful life of more than one year which are capitalized in accordance with GAAP. Capital assets include: <ol style="list-style-type: none"> (a) Land, buildings (facilities), equipment, and intellectual property (including software) whether acquired by purchase, construction, manufacture, lease-purchase, exchange, or through capital leases; and (b) Additions, improvements, modifications, replacements, rearrangements, reinstallations, renovations or alterations to capital assets that materially increase their value or useful life (not ordinary repairs and maintenance).
Carryover	<i>Carryover</i> means unobligated Federal funds remaining at the end of any budget period that may be carried forward to another budget period to cover allowable costs of that budget period (whether as an offset or additional authorization). Obligated, but unliquidated, funds are not considered carryover.
Change in scope	<i>Change in scope</i> means an activity whereby the objectives or specific aims identified in the approved grant application are significantly changed by the recipient after award. Contracting Officer prior approval is required for a change in scope to be allowable under an award.
Closeout	<i>Closeout</i> means the process by which a Federal awarding agency determines that all applicable administrative actions and all required work under an award have been completed by the recipient and the Federal awarding agency.
Competitive segment	<i>Competitive segment</i> means the initial project period recommended for support or each extension of a project period resulting from a renewal award.

Conference (domestic or international)	<i>Conference (domestic or international)</i> means a symposium, seminar, workshop, or any other organized and formal meeting, whether conducted face-to-face or via the Internet, where individuals assemble (or meet virtually) to exchange information and views or explore or clarify a defined subject, problem, or area of knowledge, whether or not a published report results from such meeting.
Consortium or sub-award agreement	<i>Consortium or sub-award agreement</i> means a formalized agreement whereby a research project is carried out by the awardee and one or more other organizations that are separate legal entities. Under the agreement, the awardee must perform a substantive role in the conduct of the planned research and not merely serve as a conduit of funds to another party or parties. These agreements typically involve a specific level of effort from the consortium organization's PD/PI and a categorical breakdown of costs, such as personnel, supplies, and other allowable expenses, including F&A costs. The relationship between the recipient and the collaborating organizations is considered a sub-award relationship.
Consultant	<i>Consultant</i> means an individual who provides professional advice or services for a fee, but not as an employee of the engaging party. To prevent apparent or actual conflicts of interest, awardees and consultants must establish written guidelines indicating the conditions of payment of consulting fees. Consultants also include firms that provide professional advice or services. See 2 CFR 200.459.
Continuation application/award	<i>Continuation application/award</i> means a financial assistance request (in the form of an application or progress report) or resulting award for a subsequent budget period within a previously approved project period for which a recipient does not have to compete with other applicants.
Contract	<i>Contract</i> means a legal instrument by which a non-Federal entity purchases property or services needed to carry out the project or program under a Federal award. The term as used in this part does not include a legal instrument, even if the non-Federal entity considers it a contract, when the substance of the transaction meets the definition of a Federal award or sub-award (see 2 CFR 200.1 Subaward).
Contractor	<i>Contractor</i> means an entity that receives a contract as defined in 2 CFR 200.1 Contract.
Contracting (or Grants) Officer	<i>Contracting (or Grants) Officer</i> means a DOE official responsible for the business management aspects of grants and cooperative agreements, including review, negotiation, award, and administration, and for the interpretation of grants administration policies and provisions. COs and GOs are delegated the authority to obligate DOE to the expenditure of funds and permit changes to approved projects on behalf of DOE.
Contracting (or Grants Management) specialist	<i>Contracting (or Grants Management) specialist</i> means a DOE staff member who works with a Contracting or Grants Officer and is assigned the day-to-day management of a portfolio of grants and/or cooperative agreements. These activities include, but are not limited to, evaluating grant applications for administrative content and compliance with statutes, regulations, and guidelines; negotiating grants; providing consultation and technical assistance to recipients; and administering grants after award.
Cooperative agreement	<i>Cooperative agreement</i> means a type of financial assistance used when there will be substantial Federal scientific or programmatic involvement. Substantial involvement means that, after award, scientific or program staff will assist, guide, coordinate, or participate in project activities.
Cost principles	<i>Cost principles</i> means the government-wide principles, 2 CFR 200 Subpart E (or, in the case of commercial organizations, the Federal Acquisition Regulation [48 CFR 31], or, in the case of hospitals, see Appendix IX to Part 200—Hospital Cost Principles, Appendix E, “Principles For Determining

	Costs Applicable to Research and Development Under Grants and Contracts with Hospitals”), on allowability and unallowability of costs under federally sponsored agreements.
Cost sharing or matching	<i>Cost sharing or matching</i> means the portion of project costs not paid by Federal funds (unless otherwise authorized by Federal statute). See also 2 CFR 200.306 Cost sharing or matching.
Deadline	<i>Deadline</i> means the published date and/or time that a grant application is to be submitted to the funding agency.
Debarment and suspension	<i>Debarment and suspension</i> means the actions taken by a debarment official in accordance with OMB guidance at 2 CFR 180, “Non-procurement Debarment and Suspension,” to exclude a person or organization from participating in grants and other non-procurement awards government-wide. If debarred or suspended, the person or organization may not receive financial assistance (under a grant, cooperative agreement, or sub-award, or contract under a grant) for a specified period of time. Debarments and suspensions carried out pursuant to 2 CFR 376 are distinct from post-award suspension action by an awarding agency. See 2 CFR 901 for DOE implementation.
Direct costs	<i>Direct costs</i> means costs that can be identified specifically with a particular sponsored project, an instructional activity, or any other institutional activity, or that can be directly assigned to such activities relatively easily with a high degree of accuracy. See 2 CFR 200.413.
Disallowed costs	<i>Disallowed costs</i> means those charges to a Federal award that the Federal awarding agency or pass-through entity determines to be unallowable, in accordance with the applicable Federal statutes, regulations, or the terms and conditions of the Federal award.
Domestic organization	<i>Domestic organization</i> means a public (including a State or other governmental agency) or private non-profit or for-profit organization that is located in the United States or its territories, is subject to U.S. laws, and assumes legal and financial accountability for awarded funds and for the performance of the grant-supported activities.
Effort	<i>Effort</i> means the amount of time, usually expressed as a percentage of the total, which a faculty member or other employee spends on a sponsored project. No one is allowed to spend more than 100% total commitment on all academic activities, including grant-sponsored research, university-sponsored research, teaching, administration, advising and other contracted duties. Effort is indicated on the budget in units of person-months.
Equipment	<i>Equipment</i> means tangible personal property (including information technology systems) having a useful life of more than one year and a per-unit acquisition cost which equals or exceeds the lesser of the capitalization level established by the non-Federal entity for financial statement purposes, or \$5,000. See also 2 CFR 200.1 Capital assets, Computing devices, General purpose equipment, Information technology systems, Special purpose equipment, and Supplies.
Expanded authorities	<i>Expanded authorities</i> means authorization to recipients under certain research grant mechanisms which waives the requirement for prior agency approval for specified actions related to awards. Example: 90-day pre-award spending authority, no cost extensions for up to one additional year, and automatic carryover of unobligated funds from one budget period to the next. The expanded authorities are now contained in the standard terms and conditions for most research grants.
Expiration date	<i>Expiration date</i> means generally, the date signifying the end of the current project period, after which the recipient is not authorized to obligate grant funds.
Facilities and administrative costs	<i>Facilities and administrative costs</i> means costs that are incurred by a recipient for common or joint objectives and that, therefore, cannot be identified

	specifically with a particular project or program. These costs also are known as indirect costs.
Federal financial report	<i>Federal financial report</i> means submitted on Standard Form (SF) 425, to indicate the status of awarded funds for the period covered. Frequency of reporting is specified in the Reporting Checklist provided as part of the award documents.
Financial assistance	<i>Financial assistance</i> means transfer by DOE of money or property to an eligible entity to support or stimulate a public purpose authorized by statute.
Financial status report	<i>Financial status report</i> means see Federal Financial Report.
Foreign travel	<i>Foreign travel</i> is meant to include travel outside of North America (Canada, Mexico, and the United States) and U.S. territories and possessions (Guam, American Samoa, Puerto Rico, the U.S. Virgin Islands. A trip is considered foreign travel for all legs of the itinerary if the traveler does not return to his or her post prior to departure for a foreign destination. Costs for foreign travel may be restricted by the language of a Funding Opportunity Announcement.
Funding opportunity announcement (FOA)	<i>Funding opportunity announcement (FOA)</i> means A publicly available document by which a Federal Agency makes known its intentions to award discretionary grants or cooperative agreements, usually as a result of competition for funds. Funding opportunity announcements may be known as program announcements, requests for applications, notices of funding availability, solicitations, or other names depending on the Agency and type of program. Funding opportunity announcements can be found at www.Grants.gov . An FOA may also be known as a solicitation.
Grant agreement	<p><i>Grant agreement</i> means a legal instrument of financial assistance between a Federal awarding agency or pass-through entity and a non-Federal entity that, consistent with 31 USC 6302, 6304:</p> <p>(a) Is used to enter into a relationship the principal purpose of which is to transfer anything of value from the Federal awarding agency or pass-through entity to the non-Federal entity to carry out a public purpose authorized by a law of the United States (see 31 USC 6101(3)); and not to acquire property or services for the Federal awarding agency or pass-through entity’s direct benefit or use;</p> <p>(b) Is distinguished from a cooperative agreement in that it does not provide for substantial involvement between the Federal awarding agency or pass-through entity and the non-Federal entity in carrying out the activity contemplated by the Federal award.</p> <p>(c) Does not include an agreement that provides only:</p> <ol style="list-style-type: none"> (1) Direct United States Government cash assistance to an individual; (2) A subsidy; (3) A loan; (4) A loan guarantee; or (5) Insurance.
Grant-supported project or activity	<i>Grant-supported project or activity</i> means those activities specified or described in a grant application or in a subsequent submission that are approved by DOE for funding, regardless of whether Federal funding constitutes all or only a portion of the financial support necessary to carry them out.
Grantee	<i>Grantee</i> means the organization or individual awarded a grant or cooperative agreement by DOE that is responsible and accountable for the use of the funds provided and for the performance of the grant-supported project or activity. The grantee is the entire legal entity even if a particular component is designated in award documents. The grantee is legally responsible and accountable to DOE for the performance and financial aspects of the grant-supported project or activity. Also known as awardee or recipient.
Grants.gov	<i>Grants.gov</i> (https://www.Grants.gov/) has been designated by the Office of

	Management and Budget as the single access point for all grant programs offered by 26 Federal grant-making agencies. It provides a single interface for agencies to announce their grant opportunities and for all applicants to find and apply for those opportunities.
Indirect costs (facilities & administrative)	<i>Indirect (F&A) costs</i> means those costs incurred for a common or joint purpose benefitting more than one cost objective, and not readily assignable to the cost objectives specifically benefitted, without effort disproportionate to the results achieved. To facilitate equitable distribution of indirect expenses to the cost objectives served, it may be necessary to establish a number of pools of indirect (F&A) costs. Indirect (F&A) cost pools must be distributed to benefitted cost objectives on bases that will produce an equitable result in consideration of relative benefits derived.
Institutional base salary	<i>Institutional base salary</i> means the annual compensation paid by an organization for an employee's appointment, whether that individual's time is spent on research, teaching, patient care, or other activities. Base salary excludes any income that an individual may be permitted to earn outside of duties for the applicant/awardee organization. Base salary may not be increased as a result of replacing organizational salary funds with grant funds.
Matching or cost sharing	<i>Matching or cost sharing</i> means the value of third-party in-kind contributions and the portion of the costs of a federally assisted project or program not borne by the Federal government. Matching or cost sharing may be required by statute or program regulation. Costs used to satisfy matching or cost-sharing requirements are subject to the same policies governing allowability as other costs under the approved budget.
Merit (or peer) review	<i>Merit (or peer) review</i> means the process that involves the consistent application of standards and procedures that produce fair, equitable, and objective examinations of applications based on an evaluation of scientific or technical merit or other relevant aspects of the application. The review is performed by experts (reviewers) in the field of endeavor for which support is requested. Merit review is intended to provide guidance to the DOE individuals responsible for making award decisions.
Monitoring	<i>Monitoring</i> means a process whereby the programmatic and business management performance aspects of a grant are assessed by reviewing information gathered from various required reports, audits, site visits, and other sources.
NEPA	<i>NEPA</i> means the National Environmental Policy Act (NEPA), Public Law 91-190, as amended. NEPA requires Federal agencies to assess the environmental effects of proposed major Federal actions prior to making decisions.
No-cost extension	<i>No-cost extension</i> means an extension of time to a project period and/or budget period to complete the work of the grant under that period, without additional Federal funds or competition.
Non-Federal share	<i>Non-Federal share</i> means when cost sharing or matching is required as a condition of an award, the portion of allowable project/program costs not borne by the Federal government.
Obligations	<i>Obligations</i> when used in connection with a non-Federal entity's utilization of funds under a Federal award, <i>obligations</i> means orders placed for property and services, contracts and sub-awards made, and similar transactions during a given period that require payment by the non-Federal entity during the same or a future period.
OMB circulars	<i>OMB circulars</i> means government-wide guidance issued to Heads of Federal agencies by the Director of the Office of Management and Budget.
Other significant contributors	<i>Other significant contributors</i> means individuals who have committed to contribute to the scientific development or execution of the project, but are not committing any specified measurable effort (i.e., person months) to the project. These individuals are typically presented at "effort of zero person months" or

	“as needed.” Individuals with measurable effort may not be listed as Other Significant Contributors (OSCs). Consultants should be included if they meet this definition.
Program participant	<i>Program participants</i> are the recipients of service or training provided at a workshop, conference, seminar, symposium or other short-term instructional or information-sharing activity funded by an external grant or award, or the training beneficiaries of the project or program funded by an external grant or award. A participant is not involved in providing any deliverable to the recipient or a third party or would not be terminated or replaced for failure to perform.
Participant support costs	<i>Participant support costs</i> means direct costs for items such as stipends or subsistence allowances, travel allowances, and registration fees paid to or on behalf of participants or trainees (but not employees) in connection with conferences, or training projects.
Person months	<i>Person months</i> is the metric for expressing the effort (amount of time) PD/PI(s), faculty and other senior/key personnel devote to a specific project. The effort is based on the type of appointment of the individual with the organization; e.g., calendar year, academic year, and/or summer term; and the organization’s definition of such. For instance, some institutions define the academic year as a 9-month appointment while others define it as a 10-month appointment.
Pre-application or pre-proposal	<i>Pre-application or pre-proposal</i> means a brief outline or narrative of proposed work and sometimes budget, for informal review by a sponsor to determine whether an application should be submitted. Three predominant reasons for requiring submission of a preliminary pre-application are: <ul style="list-style-type: none"> • Reduce the applicant’s unnecessary effort in proposal preparation when the chance of success is very small. This is particularly true of exploratory initiatives where the community senses that a major new direction is being identified, or competitions that will result in a small number of actual awards. • Increase the overall quality of the submission. • Distill the number of applications that will be submitted to the agency and the number of anticipated reviewers needed to review.
Pre-award costs	<i>Pre-award costs</i> means any cost incurred prior to the beginning date of the project period or the initial budget period of a competitive segment (under a multi-year award), in anticipation of the award and at the applicant’s own risk, for otherwise allowable costs.
Prior approval	<i>Prior approval</i> means written approval from the designated Contracting Officer.
Program Director/ Principal Investigator	<i>Program Director/ Principal Investigator</i> means the individual(s) designated by the applicant organization to have the appropriate level of authority and responsibility to direct the project or program to be supported by the award. The applicant organization may designate multiple individuals as program directors/principal investigators (PD/PIs) who share the authority and responsibility for leading and directing the project, intellectually and logistically. When multiple PD/PIs are named, each is responsible and accountable to the applicant organization, or as appropriate, to a collaborating organization for the proper conduct of the project or program including the submission of all required reports. The presence of more than one PD/PI on an application or award diminishes neither the responsibility nor the accountability of any individual PD/PI.
Program income	<i>Program income</i> means gross income earned by the non-Federal entity that is directly generated by a supported activity or earned as a result of the Federal award during the period of performance except as provided in 2 CFR 200.307 paragraph (f). (See 2 CFR 200.1 Period of performance.) Program income

	includes but is not limited to income from fees for services performed, the use or rental or real or personal property acquired under Federal awards, the sale of commodities or items fabricated under a Federal award, license fees and royalties on patents and copyrights, and principal and interest on loans made with Federal award funds. Interest earned on advances of Federal funds is not program income. Except as otherwise provided in Federal statutes, regulations, or the terms and conditions of the Federal award, program income does not include rebates, credits, discounts, and interest earned on any of them. See also 2 CFR 200.407 Prior written approval (prior approval). See also 35 USC 200-212 “Disposition of Rights in Educational Awards” for inventions made under Federal awards.
Program Manager	<i>Program Manager</i> means the DOE official responsible for the programmatic, scientific, and/or technical aspects of a grant. The same role is filled by Program Directors, Program Officers, or Project Directors at other Federal agencies.
Progress report	<i>Progress report</i> means periodic, frequently annual, report submitted by the awardee and used by DOE to assess progress and to determine whether to provide funding for the budget period subsequent to that covered by the report.
Project/performance site	<i>Project/performance site</i> means location(s) of where the work described in the research plan will be conducted.
Project period	<i>Project period</i> means the total time for which Federal support of a project has been programmatically approved as shown in the award documents; however, it does not constitute a commitment by the Federal government to fund the entire period. The total award period comprises the initial competitive segment, any subsequent competitive segments resulting from a renewal award(s), and extensions.
Proposal	See application.
Re-budgeting	<i>Re-budgeting</i> means reallocation of funds available for spending between approved budget categories to allow best use of funds to accomplish the project goals.
Real Property	<i>Real property</i> means land, including land improvements, structures and appurtenances thereto, but excludes moveable machinery and equipment.
Recipient	<i>Recipient</i> means the organizational entity or individual receiving a grant or cooperative agreement.
Renewal application	<i>Renewal application</i> means an application requesting additional funding for a period subsequent to that provided by a current award. Renewal applications compete for funds with all other peer reviewed applications and must be developed as fully as though the applicant is applying for the first time.
Research	<i>Research</i> is defined as a systematic study directed toward fuller scientific knowledge or understanding of the subject studied. See 2 CFR 200.1 Research and Development (R&D).
Research misconduct	<i>Research misconduct</i> means fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results, but does not include honest error or differences of opinion. See 10 CFR 733.
SAM.gov	<i>SAM.gov</i> is the System for Award Management (SAM) a consolidated service that includes Entity Registration, Assistance Listings, and other services for making, managing, and receiving Federal awards.
Scope of work	<i>Scope of work</i> means the aims, objectives, and purposes of a grant; as well as the methodology, approach, analyses or other activities; and the tools, technologies, and timeframes needed to meet the grant’s objectives. This includes the research or training plan included with the original grant application, along with any approved modifications.
Senior/Key Personnel	<i>Senior/Key personnel</i> means the PD/PI and other individuals who contribute to the scientific development or execution of a project in a substantive, measurable way, whether or not they receive salaries or compensation under

	the grant. Typically, these individuals have doctoral or other professional degrees, although individuals at the masters or baccalaureate level may be considered senior/key personnel if their involvement meets this definition. Consultants and those with a postdoctoral role also may be considered senior/key personnel if they meet this definition. “Zero percent” effort or “as needed” is not an acceptable level of involvement for Senior/Key Personnel.
Significant re-budgeting	<i>Significant re-budgeting</i> means a threshold that is reached when expenditures in a single direct cost budget category deviate (increase or decrease) from the categorical commitment level established for the budget period by more than 25 percent of the total costs awarded. Significant re-budgeting is one indicator of change in scope.
Small business concern	<i>Small business concern</i> means a business that meets the regulatory and size requirements established by the SBA at 13 CFR 121.
Solicitation	See Funding Opportunity Announcement.
Subaward	<i>Subaward</i> means a legal instrument by which a recipient provides funds (or property in lieu of funds) to an eligible subrecipient (or a lower-tier transaction) to perform a substantive portion of the grant-supported program or project. The term includes such financial assistance when provided by any legal agreement (even if the agreement is called a contract) but does not include any form of assistance which is excluded from the definition of a grant, including the recipient’s procurement of property or services needed to carry out the project or program. The term includes consortium agreements.
Subrecipient	<i>Subrecipient</i> means a non-Federal entity that receives a subaward from a pass-through entity to carry out part of a Federal program; but does not include an individual that is a beneficiary of such program. A sub-recipient may also be a recipient of other Federal awards directly from a Federal awarding agency.
Supplement	<i>Supplement</i> means a request for an increase in support during a current budget period for expansion of the project’s scope or to meet increased costs unforeseen at the time of the new or renewal application. A supplement may increase support for future years in addition to the current year. Supplements require applications and are subject to administrative and merit review.
Terms and conditions of award	<i>Terms and conditions of award</i> means all legal requirements imposed on a grant by DOE, whether based on statute, regulation, policy, or other document referenced in the grant award, or specified by the grant award document itself. The award documents may include both standard and special conditions that are considered necessary to attain the grant’s objectives, facilitate post-award administration of the grant, conserve grant funds, or otherwise protect the Federal government’s interests.
UEI	<i>UEI</i> is the Unique Entity Identifier, a twelve-digit alphanumeric sequence established and assigned by the System for Award Management at https://www.SAM.gov to uniquely identify an entity.
Unallowable costs	<i>Unallowable costs</i> means costs that cannot be charged, directly or indirectly, to Federal awards because the costs are prohibited by law, regulation (including applicable cost principles), or the terms and conditions of award. Costs that are not allowable, allocable, or reasonable are unallowable.
Unliquidated obligation	<i>Unliquidated obligations</i> means, for financial reports prepared on a cash basis, obligations incurred by the non-Federal entity that have not been paid (liquidated). For reports prepared on an accrual expenditure basis, these are obligations incurred by the non-Federal entity for which an expenditure has not been recorded.
Unobligated balance	<i>Unobligated balance</i> means the amount of funds under a Federal award that the non-Federal entity has not obligated. The amount is computed by subtracting the cumulative amount of the non-Federal entity’s unliquidated obligations and expenditures of funds under the Federal award from the cumulative amount of the funds that the Federal awarding agency or pass-

	through entity authorized the non-Federal entity to obligate.
Validate	In the context of the data management plan requirements, <i>validate</i> means to support, corroborate, verify, or otherwise determine the legitimacy of the research findings. Validation of research findings could be accomplished by reproducing the original experiment or analyses, comparing and contrasting the results against those of a new experiment or analyses, or by some other means.