

**PROGRAM ANNOUNCEMENT
TO DOE NATIONAL LABORATORIES**



**U. S. Department of Energy
Office of Science
High Energy Physics**

FY2017 Research Opportunities in Accelerator Stewardship

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UPDATES AND REMINDERS

NEW IN THIS SOLICITATION

This year's Solicitation includes the continuation of the Accelerator Stewardship Test Facility Program (ASTFP), begun in pilot form in 2015. Note that, like the other R&D "Tracks" in this solicitation, there are eligibility requirements and instructions that are specific to this Track.

DATA MANAGEMENT PLAN

The Office of Science has published a new Statement on Digital Data Management, published at <http://science.energy.gov/funding-opportunities/digital-data-management/>, which governs applications submitted under this FOA, and is detailed in Part IV of this FOA.

ACKNOWLEDGMENT OF FEDERAL SUPPORT

The Office of Science published guidance about how its support should be acknowledged at <http://science.energy.gov/funding-opportunities/acknowledgements/>.

RECOMMENDATION

You are also encouraged to submit letters of intent, pre-applications, and applications well before the deadline.

FREQUENTLY ASKED QUESTIONS

Applicants are strongly encouraged to review the "Frequently Asked Questions" document that accompanies this solicitation: <http://science.energy.gov/hep/funding-opportunities/>.

REGISTRATIONS

A. DOE Office of Science Portfolio Analysis and Management System (PAMS)

The DOE Office of Science performs many functions for DOE national laboratory proposals in the Portfolio Analysis and Management System (PAMS), which is available at <https://pamspublic.science.energy.gov>.

There are many activities that you can perform in PAMS, and more functionality will be added throughout the near future. DOE national laboratories will submit pre-proposals, letters of intent, and proposals directly into PAMS.

You must register in PAMS to submit a pre-proposal, letter of intent, or DOE national laboratory proposal.

To access PAMS, you may use the Internet Explorer, Firefox, Google Chrome, or Safari browsers.

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.

1. 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 the “Having Trouble Logging In?” page. (Note: If you reviewed for or were listed as PI on a prior submission to the Office of Science but have not previously created an account, you may already be linked to an institution in PAMS. If this is the case, PAMS will take you to the PAMS home page.)

2. 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 need not enter the exact name of the institution, but you should enter a word or phrase contained within the institution name. (Hint: If your institution has an acronym, such as ANL for Argonne National Laboratory or UCLA for the Regents of the University of California, Los Angeles, you may 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.
- All DOE National Laboratories have established profiles in PAMS, so please keep searching until you find your laboratory.

For help with PAMS, click the “External User Guide” 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 DOE National Laboratory Announcement should reference **LAB 17-1779**.

RECOMMENDATION

The Office of Science encourages you to register in all systems as soon as possible. You are also encouraged to submit letters of intent, pre-proposals, and proposals well before the deadline.

Section I – DOE NATIONAL LABORATORY OPPORTUNITY DESCRIPTION

GENERAL INQUIRIES ABOUT THIS ANNOUNCEMENT SHOULD BE DIRECTED TO:

Technical/Scientific Program Contact:

Dr. Eric R. Colby
301-903-5475
Eric.Colby@science.doe.gov

Administrative Contact:

Questions about non-technical matters including program rules may be sent to:
SC.HEPfoa@science.doe.gov

SUMMARY

SUPPLEMENTARY INFORMATION

The following program description is offered to provide more in-depth information on scientific and technical areas of interest to the Office of High Energy Physics Long-Term Accelerator R&D Stewardship (“Accelerator Stewardship”) program.

Please note that this Funding Opportunity Announcement is only for opportunities within the Accelerator R&D Stewardship mission, and that there is a separate Funding Opportunity Announcement for research and development within the objectives of the High Energy Physics program. This Accelerator Stewardship FOA is for R&D activities that may impact High Energy Physics, but which predominantly impact other non-HEP applications.

The mission of the Accelerator Stewardship program is to support fundamental accelerator science and technology development of relevance to many fields beyond High Energy Physics, and to disseminate accelerator knowledge and training to the broad community of accelerator users and providers. Further information about the Accelerator Stewardship program may be found at <http://science.energy.gov/hep/research/accelerator-stewardship/>.

Many federal agencies have a vested interest in the success of accelerator R&D. Beyond the Office of Science, stakeholders include the DOE National Nuclear Security Administration, the DOE Environmental Management Program Office, the NIH National Cancer Institute, the NSF Division of Physics, the NSF Division of Chemical, Bioengineering, Environmental, and Transport Systems, the DOD Office of Naval Research, the DOD Air Force Office of Scientific Research, the DHS Domestic Nuclear Detection Office, the NASA Radiation Effects & Analysis Group, and the NIST Ionizing Radiation Physics Division, among others.

Central goals of Accelerator R&D 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 the DOE Office of Science specifically, and other federal agencies generally, to conduct their missions;

- Enhance the accelerator technology capabilities of U. S. industry;
- Facilitate access to the accelerator R&D capabilities at the DOE Office of Science National Laboratories
- Drive a limited number of specific accelerator applications towards practical, testable prototypes in a 5-7 year timeframe;
- Foster collaboration between developers of accelerator technology and experts who apply accelerator technology;
- Provide the basic R&D foundation necessary for sustained innovation across a broad range of accelerator applications.

This call for applications is focused on two distinct activities:

(1) applied research¹ that is focused on developing a prototype in response to a specific technical challenge,

(2) facilitating access to accelerator R&D capabilities at the Office of Science National Laboratories for academic research.

These activities are divided into separate “Tracks” in this Program Announcement. Proposals must address a topic in one Track **only**. Topics may not be combined between Tracks as the proposal 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: <http://science.energy.gov/hep/research/accelerator-stewardship/awards/> .

Applications that are intended to meet specific BES or NP programmatic fields of research should be submitted in response to the FOAs issued by those Offices.

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 current annual Office of Science Funding Opportunity Announcement.

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 1-2 grant cycles (e.g. 3-6 years) is a working prototype technology. This Track has broad eligibility requirements,

¹ 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 (TRL 0-4) 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, and consequently excluded from cost sharing requirements per 42 USC 16352(b)(2).

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 a proposal 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's² 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; 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.

There are three topic areas active in Track 1 of this FOA:

- a) Particle Therapy Beam Delivery Improvements
- b) Ultrafast Laser Technology Program
- c) Energy and Environmental Applications of Accelerators

Grant 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 grant applications, grant 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

²"Stewardship Customer" is defined in section V.A.2.

detector systems to guide and verify dose placement.

Proposals 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 each 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 marketing EBRT products. Applications lacking significant participation from either a clinical or accelerator technology partner and/or lacking an industry partner 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. Proposals to design an accelerator or accelerator complex are outside the scope of this call, and such proposals 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, the call for applications on beam diagnostic technologies for ion beam therapy is limited to diagnostics applied to the charged particle beam prior to its exit from the nozzle. Applications for imaging technologies downstream of the nozzle will be declined without review.

PIs 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 http://science.energy.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:

- 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:

- 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 basic laser types, summarized in Table 1 below.

Table 1. 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%

- 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.

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. Grant 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. Proposals 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.

PIs 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 http://science.energy.gov/~media/hep/pdf/accelerator-rd-stewardship/Lasers_for_Accelerators_Report_Final.pdf.

(c) High Power Electron Accelerator Technology for Energy and Environmental 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 arena including: treating potable and waste water, 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:

- 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 energy & environmental applications, and to enhance industry's capability to produce the necessary technologies.

The general requirements for high power electron accelerators for energy & environmental applications were identified at a recent workshop (see references below) and can be divided into four basic types of accelerator, summarized in Table 2 below.

Table 2. 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, Waste water</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
Wallplug 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.

This initial phase of the High Power Electron Accelerator Technology Program will concentrate on engineering design studies and efficient rf power source development to produce the breakthroughs in design architecture and driver technology necessary to make very high power electron accelerators practical. Grant applications are sought for the following tasks:

(1) Accelerator System Design Studies

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.

- a. **Accelerator Designs for High Efficiency High Power Accelerator Systems.** Radiofrequency accelerators optimized for accelerating multi-ampere class beams to energies of 1 to 10 MeV are required. Designs may be based on either normal conducting or superconducting rf technology, and must meet all performance metrics for one or more of the accelerator types listed in Table 2. The end product must be a report describing a conceptual design with, at a minimum:
 - i. Physics calculations and simulations that support the beam production, acceleration, and transport through the accelerator to the exit window;
 - 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.

(2) Enabling Research & Development

Proposals submitted under this subtopic are expected to be multi-year applied R&D proposals leading to very high efficiency, high average power radiofrequency sources. The proposed R&D must credibly address the high efficiency metric ($>80\%$), the threshold average power metric ($>100\text{kW}$), and the technical scalability requirement (to an economical ≥ 1 MW source), or the proposal 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 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 100 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. There is particular interest in rf power sources

operating at frequencies that are in widespread use at the large Office of Science accelerators³.

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 demonstration accelerator systems for any of the four types during this initial phase. Proposals to develop full-scale demonstration accelerator 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 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, HEP has conducted workshops to identify the accelerator technology research directions with the potential for high impact in energy & environmental applications. Workshops relevant to this topic area include:

- *Workshop on Energy and Environmental Applications of Accelerators*, Edited by Stuart Henderson and Thomas Waite, (2015). http://science.energy.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). <http://science.energy.gov/~media/hep/pdf/accelerator-rd-stewardship/Report.pdf>

Track 2: Long-Term Generic Accelerator R&D

DOE National Laboratories are not eligible to apply under Track 2.

Track 3: Accelerator Stewardship Test Facility Program

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

Track 3 is the continuation of the “Accelerator Stewardship Test Facility Pilot Program” (ASTFPP), initiated in 2015. 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 Office of Science National Laboratories that are not otherwise available as Office of Science User Facilities.

A wide array of test stands and facilities for microwave, laser, magnet, superconducting RF, and

³ See <http://science.energy.gov/user-facilities/user-facilities-at-a-glance/>

particle beam testing exist, along with specialized expertise in high-accuracy accelerator modeling, engineering, fabrication and measurement. A web portal to the Office of Science accelerator R&D capabilities may be found at <http://www.acceleratorsamerica.org/working-with-labs/index.html>.

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. While small businesses may make use of SBIR/STTR awards to achieve this as part of a broader R&D effort, university PIs, large businesses, and other FFRDCs cannot. Further information about the program intent and goals may be found at <http://science.energy.gov/hep/research/accelerator-stewardship/test-facility-pilot-program/>.

Applicants **must work closely** with an Office of Science 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 proposal** must be filed, with the lead proposal originating from the non-DOE entity, and a collaborative proposal being submitted by the Host Lab in response to LAB 17-.

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 Office of Science 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 481.1C “Strategic Partnerships Projects”, in particular section 4(c):
 - 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 522.1 “Pricing of Departmental Materials and Services” 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. Grant applications that focus primarily on upgrading a DOE capability will be declined without review.

Grant applications that do not include a collaborative proposal submission from the Host Lab will be declined without review.

Applicants are advised that requests for capabilities will be reviewed by the specific Office of Science 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.

Collaboration

Collaborative teams 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 depends on the Track.

For Track 1 and Track 2, team efforts involving different institutions must be submitted as 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.

Collaborations led by a DOE National Laboratory should note that proposals must be submitted in response to the companion announcement (LAB 17-) through the Office of Science PAMS system at <https://pamspublic.science.energy.gov>. Collaborations led by a non-DOE entity should be submitted through the companion Funding Opportunity Announcement (**DE-FOA-0001779**).

For Track 3, team efforts must include both a non-DOE entity and a DOE Office of Science Host Laboratory, and a *collaborative proposal must be submitted, with the non-DOE entity designated as the lead institution*. If successful, the collaboration will be funded in accordance with section II.H.

Collaborative applications submitted from different institutions must clearly indicate they are part of a collaborative project/group. Every partner institution must submit an application through its own sponsored research office. Each collaborative group can have only one lead institution. Each application within the collaborative group, including the narrative and all required appendices and attachments, must be identical with the following exceptions:

- Each application must contain a correct SF-424 (R&R) 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.
- A DOE Office of Science National Laboratory serving as a "Host Lab" should submit a collaborative proposal in response to the companion announcement (LAB 17-). through the Office of Science PAMS system at <https://pamspublic.science.energy.gov>. Note that the non-DOE entity must submit the lead proposal to the companion Funding Opportunity Announcement (**DE-FOA-0001779**).

Collaborations that are not led by a DOE National Laboratory should note that proposals must be submitted in response to the companion funding opportunity announcement (**DE-FOA-0001779**)

through Grants.gov.

PROPOSAL REQUIREMENTS

All proposals submitted to this DOE National Laboratory Program Announcement (LAB) must address one of the research topic areas described in the previous section. Further, all proposals must conform to the format specified in Section IV of this LAB; each proposal will be pre-screened for responsiveness to the research area descriptions and for compliance with the proposal requirements.

Section II – AWARD INFORMATION

A. TYPE OF AWARD INSTRUMENT

DOE anticipates awarding laboratory work authorizations under this DOE National Laboratory Program Announcement.

B. ESTIMATED FUNDING

It is anticipated that approximately \$3,000,000 will be available for all Accelerator R&D Stewardship new and renewal awards in FY 2017, subject to the availability of appropriated funds. The number, duration and size of awards will depend on the number of applications selected for award, and the actual amount of funds available in FY 2017. Out of the approximately \$3,000,000 in total funding, approximately \$500,000 may be awarded in the Track 2 topic area of Long-Term Generic Accelerator R&D, and approximately \$500,000 may be awarded in the Track 3 Accelerator Stewardship Test Facility Program.

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

Track 1: No award limits.

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

D. EXPECTED NUMBER OF AWARDS

The exact number of awards will depend on the number of meritorious proposals, the results of merit review, the program policy factors, and the availability of appropriated funds.

E. ANTICIPATED AWARD SIZE

The anticipated award size will depend on the number of meritorious proposals, the results of merit review, the program policy factors, and the availability of appropriated funds.

F. PERIOD OF PERFORMANCE

The period of performance will depend on the number of meritorious proposals, 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.

G. TYPE OF PROPOSAL

DOE will accept new DOE National Laboratory Proposals under this DOE National Laboratory Announcement. Please only submit a PAMS lab technical proposal in response to this Announcement; do not submit a DOE Field Work Proposal (FWP) at this time. The Office of Science will request FWPs later from those selected for funding consideration under this Announcement.

Section III – ELIGIBILITY INFORMATION

A. ELIGIBLE APPLICANTS AND TOPICS

This is a DOE National Laboratory-only Announcement. FFRDCs from other Federal agencies are not eligible to submit in response to this Program Announcement.

B. COST SHARING

Cost sharing is not required.

A demonstration of institutional commitment to the proposed activity **is strongly encouraged** for all applications, especially for Track 1 and Track 3 applicants.

Examples of non-Federal contributions that may be considered as demonstrating institutional commitment include allowable costs in accordance with the applicable cost principles, including:

- (A) cash;
- (B) personnel costs;
- (C) the value of a service, other resource, or third party in-kind contribution determined in accordance with the applicable circular of the Office of Management and Budget;
- (D) indirect costs or facilities and administrative costs;

but shall **not** include:

- (A) revenues or royalties from the prospective operation of an activity beyond the time considered in the award;
- (B) proceeds from the prospective sale of an asset of an activity; or
- (C) other appropriated Federal funds.

Reviewers will be asked to evaluate the degree of institutional commitment; for Track 1 and Track 3 applications, the demonstration of institutional commitment will be taken as evidence of the Stewardship customer's interest in the outcome. See sections V.A.2 and V.B.2.

C. ELIGIBLE INDIVIDUALS

Eligible individuals with the skills, knowledge, and resources necessary to carry out the proposed research as a Lead Principal Investigator/Principal Investigator are invited to work with their organizations to develop a proposal. Individuals from underrepresented groups as well as individuals with disabilities are always encouraged to apply.

Section IV – PROPOSAL AND SUBMISSION INFORMATION

A. ADDRESS TO REQUEST PROPOSAL PACKAGE

Proposal submission instructions are available in this Announcement on the DOE Office of Science Portfolio Analysis and Management System (PAMS). Screenshots showing the steps in DOE National Laboratory proposal submission are available in the PAMS External User Guide, accessible by navigating to <https://pamspublic.science.energy.gov> and clicking on the “PAMS External User Guide” link.

Proposals submitted outside of PAMS will not be accepted.

B. LETTER OF INTENT AND PRE-PROPOSAL

1. Letter of Intent

No letter of intent is required.

2. Pre-proposal

PRE-PROPOSAL DUE DATE

June 15, 2017, at 5 PM Eastern Time

ENCOURAGE/DISCOURAGE DATE

June 23, 2017 at 5 PM Eastern Time

A pre-proposal is required and must be submitted by **June 15, 2017, at 5 PM Eastern Time**.

Pre-proposals will be reviewed for responsiveness of the proposed work to the research topics identified in this PA. DOE will send a response by email to each applicant encouraging or discouraging the submission of a proposal by **June 23, 2017 at 5 PM Eastern Time**. Applicants who have not received a response regarding the status of their pre-proposal by this date are responsible for contacting the program to confirm this status.

The pre-proposal attachment should include, at the top of the first page, the following information:

Title of Preproposal
Principal Investigator Name, Job Title
Institution
PI Phone Number, PI Email Address
Funding Opportunity Announcement Number: LAB 17-
Proposal Type: [New or Renewal]
Track # / Topic #

This information should be followed by a clear and concise description of the objectives and technical approach of the proposed research, organized into the following required sections:

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

Stewardship Customer: Who is the Stewardship Customer? What evidence is there that the proposed work address a priority need of the Customer? (See section V.A for the definition of “Stewardship Customer”, and examples of evidence of Customer need.)

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, Milestones: Provide a high-level description of the cost, schedule, and major milestones of the proposed work. Include a table similar to:

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-proposal may not exceed two pages, with a minimum text font size of 11 point and margins no smaller than one inch on all sides. Figures and references, if included, must fit within the two-page limit. Do not include a cover page.

The pre-proposal must also include a list of the names and institutional affiliations of all participating investigators, including collaborators and consultants on the proposed project.

Those pre-proposals that are encouraged will be used to help the Office of Science begin planning for the proposal peer review process. The intent of the Office of Science in discouraging submission of certain proposals is to save the time and effort of applicants in preparing and submitting proposals not responsive to this funding opportunity announcement.

The Principal Investigator will be automatically notified when the pre-proposal is encouraged or discouraged. The DOE Office of Science Portfolio Analysis and Management System (PAMS) will send an email to the Principal Investigator from PAMS.Autoreply@science.doe.gov, and the status of the pre-proposal 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.

It is important that the pre-proposal be a single file with extension .pdf, .docx, or .doc. The pre-proposal must be submitted electronically through the DOE Office of Science Portfolio Analysis and Management System (PAMS) website <https://pamspublic.science.energy.gov/>. The Principal Investigator and anyone submitting on behalf of the Principal Investigator must register for an account in PAMS before it will be possible to submit a pre-proposal. All PIs and those submitting pre-proposals on behalf of PIs are encouraged to establish PAMS accounts as soon as possible to avoid submission delays.

You may use the Internet Explorer, Firefox, Google Chrome, or Safari browsers to access PAMS.

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 the “Having Trouble Logging In?” page. (If you have been an Office of Science merit reviewer or if you have previously submitted a proposal, 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.

Submit Your Pre-Proposal:

- Create your pre-proposal (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 Principal Investigator (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.

For help with PAMS, click the “External User Guide” 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 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 Program Announcement should reference **LAB 17-**.

Preproposals submitted outside PAMS will not be considered. Preproposals may not be submitted through grants.gov or www.FedConnect.net.

C. CONTENT AND PROPOSAL FORMS

PROPOSAL DUE DATE

July 17, 2017, at 5 PM Eastern Time

Files that are attached to the forms must be in Adobe Portable Document Format (PDF) unless otherwise specified in this announcement. 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 attach PDF portfolios.

LETTERS

Letters of support are not necessary with pre-proposals, but may be useful with full proposals.

1. Summary of Proposal Contents and Information about PAMS

Each DOE National Laboratory proposal will contain the following sections:

- Budget, entered into PAMS as structured data using the PAMS budget form
- Abstract (one page), entered into PAMS as a separate pdf
- Budget justification, entered into PAMS as a separate pdf
- Proposal, combined into a single pdf containing the following information:
 - Proposal Cover Page
 - Table of Contents

- Project Narrative (main technical portion of the proposal, including background/introduction, proposed research and methods, timetable of activities, and responsibilities of key project personnel – note strict page limits)
- Appendix 1: Biographical Sketch(es)
- Appendix 2: Current and Pending Support
- Appendix 3: Bibliography and References Cited
- Appendix 4: Facilities and Other Resources
- Appendix 5: Equipment
- Appendix 6: Data Management Plan
- Appendix 7: Other Attachments (optional)

SUBMISSION INSTRUCTIONS

Full proposals must be submitted into the DOE Office of Science Portfolio Analysis and Management System (PAMS). For help with PAMS, click the “External User Guide” 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 number) or (301) 903-9610, Email: sc.pams-helpdesk@science.doe.gov. All submissions and inquiries about this Program Announcement should reference LAB 17-. Proposals submitted in response to this Program Announcement must be submitted to PAMS no later than July 17, 2017, at 5 PM Eastern Time.

All PIs and those submitting on behalf of PIs are encouraged to establish PAMS accounts as soon as possible to ensure timely submissions. To register, click “Create New PAMS Account” on the website <https://pamspublic.science.energy.gov/> and follow the instructions for creating an account.

The following information is provided to help with proposal submission. Detailed instructions and screen shots can be found in the user guide. To find the user guide, click the “External User Guide” link on the PAMS home page. Onscreen instructions are available within PAMS.

- Log into PAMS. From the proposals tab, click the “View DOE National Laboratory 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 Proposal” from the dropdown.
- Note that you must select one and only one Principal Investigator (PI) per proposal; 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 proposal. Save the proposal for later work by selecting “Save” from the dropdown at the bottom of the screen and then clicking the “Go” button. It will be stored in “My Proposals” for later editing. As a minimum, you must complete all the required fields on the PAMS cover page before you can save the proposal for the first time.

- The cover page, budget, and attachments sections of the lab proposal are required by PAMS before it can be submitted to DOE.
- Complete the sections in PAMS one at a time, starting with the cover page and following the instructions for each section.
- Click the “+View More” link at the top of each section to expand the onscreen instructions. On the budget section, click the “Budget Tab Instructions” link to obtain detailed guidance on completing the budget form.
- Save each section by selecting either “Save” (to stay in the same section) or “Save... and Continue to the Next Section” (to move to the next section) from the dropdown menu at the bottom of the screen, followed by clicking the “Go” button.
- If you save the proposal and navigate away from it, you may return later to edit the proposal by clicking the “View My Existing Proposals” or “My Proposals” links within PAMS.
- You must enter a budget for each annual budget period.
- You must also enter a budget for each proposed sub-award. The sub-award section can be completed using the same steps used for the budget section.
- In the attachments section of the lab proposal, the abstract, the budget justification, and the proposal narrative are required and must be submitted as separate files.
- You must bundle everything other than the budget, abstract, and budget justification into one single PDF file to be attached under “Proposal Attachment.”
- Do not attach anything under “Other Attachments.”
- To upload a 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.
- Once you have saved all of the sections, the “Submit to DOE” option will appear in the dropdown menu at the bottom of the screen.
- To submit the proposal, select “Submit to DOE” from the dropdown menu and then click the “Go” button.
- Upon submission, the PI will receive an email from the PAMS system <PAMS.Autoreply@science.doe.gov> acknowledging receipt of the proposal.
- The proposal will also appear under My Proposals with a Proposal Status of “Submitted to DOE.”

Please only submit a PAMS lab technical proposal in response to this Announcement; do not submit a DOE Field Work Proposal (FWP) at this time. The Office of Science will request FWPs later from those selected for funding consideration under this Announcement.

For help with PAMS, click the “External User Guide” 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 number) or (301) 903-9610, Email: sc.pams-helpdesk@science.doe.gov. All submissions and inquiries about this Program Announcement should reference LAB 17-.

2. Detailed Contents of the Proposal

BUDGET AND BUDGET EXPLANATION

The budget must be submitted into PAMS using the PAMS budget form. Research proposed under this Announcement may only have one annual budget period.

PAMS will calculate the cumulative budget totals for you.

A written justification of each budget item is to follow the budget pages. The budget justification should be placed in a separate, single pdf document and attached on the appropriate screen in PAMS. Further instructions regarding the budget and justification are given below and in the PAMS software.

PROJECT SUMMARY/ABSTRACT

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. Provide the name of the applicant, the project title, the project director/principal investigator(s) (PD/PI) and the PD/PI's institutional affiliation, any coinvestigators and their institutional affiliations, 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. A sample is provided below:

<p>A Really Great Idea</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 1 page when printed using standard 8.5" by 11" paper with 1" margins (top, bottom, left and right) with font not smaller than 11 point. To attach a Project Summary/Abstract, click "Add Attachment."

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

DOE COVER PAGE

The application narrative should begin with a cover page that will not count toward the project narrative page limitation. The cover 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:
- DOE National Laboratory Program Announcement: LAB 17-
- DOE/Office of Science Program Office: High Energy Physics
- DOE/Office of Science Program Office Technical Contact:
Eric.Colby@science.doe.gov
- DOE Award Number (if Renewal Application):
- PAMS Pre-Application tracking number:
- Research Track as identified in Section I of this LAB:
- Topical Area as identified in Section I of this LAB:
- 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 informal cost sharing. If necessary, modify the table below for the correct number of years.

Name and Yearly Budget for Proposals with Multiple Institutions							
	Name	Institution	Year 1 Budget	Year 2 Budget	Year 3 Budget	Total Budget	Informal Cost Share
Lead PI							
Co- PI							
Co- PI							
Co- PI							

COVER PAGE SUPPLEMENT FOR TRACK 3 COLLABORATIVE APPLICATIONS

[NB: APPLICABLE ONLY TO TRACK 3 APPLICATIONS. DO NOT INCLUDE THIS COVER PAGE SUPPLEMENT FOR A TRACK 1 APPLICATION.]

Collaborative Track 3 applications submitted from different institutions must clearly indicate they are part of a collaborative project/group. Every partner institution must submit an application through its own sponsored research office. Each collaborative group can have only one lead institution. Each application within the collaborative group, including the narrative and all required appendices and attachments, must be identical with the following exceptions:

- Each application must contain a correct SF-424 (R&R) 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.

Each Track 3 application belonging to a collaborative group should have the same title in Block 11 of the SF 424 (R&R) form.

The Office of Science will use the multiple applications associated with a collaborative group 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 collaborative group be identical (including the title) with the exception of the budget and budget justification pages.

If the Track 3 project is a collaboration, provide the following information on a separate page as a supplement to the cover page.

- List all collaborating institutions by name with each institution's principal investigator 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 collaboration.
- Include a description of each collaborating institution's facilities, equipment, and resources that will be made available to the collaborative group.
- If applicable, explain how students and junior researchers will be trained and mentored by the collaborators.

* Note that separate collaborative applications must be submitted by each participating institution.

PROJECT NARRATIVE

The project narrative **must not exceed 16 pages for Track 1 proposals, and must not exceed 5 pages for Track 3 proposals** of technical information, including charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard 8.5” by 11” paper with 1 inch margins (top, bottom, left, and right). The font must not be smaller than 11 point. Merit reviewers will only consider the number of pages specified in the first sentence of this paragraph. This page limit does not apply to the Cover Page, Budget Page(s), Budget Justification, biographical material, publications and references, and appendices, each of which may have its own page limit.

- For each senior investigator, clearly indicate the fraction of total research time during the academic year as well as summer that will be spent on the proposed research.
- References needed to cite the research described in the narrative can be listed in the Appendix material described below.

Merit reviewers will only consider the number of pages specified in the above requirement. Applications exceeding the page limit will not be reviewed and, therefore, won't be considered for funding.

Do not include any Internet addresses (URLs) that provide supplementary or additional information that constitutes a part of the application. Using Internet sites in an attempt to avoid page limits will fail: the content of those sites will not be reviewed. References posted to an Internet-based archive or publication are permitted in a list of references. See Part VIII.D for instructions on how to mark proprietary application information. To attach a Project Narrative, click “Add Attachment.”

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 grant 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. Proposals should clearly explain the technical approach(es) that will be employed and provide ample justification for their feasibility. This section should demonstrate that the

proposer 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:

- A general description of its objective;
- A detailed description of the approach to be taken to accomplish it;
- 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. 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 7: Other Attachment See also Section VIII. “Intellectual Property” 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 7: Other Attachment any formal teaming agreements that are required to execute this plan.

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 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 informal cost sharing being offered (see section III.B).

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

DOE National Laboratories are not eligible to apply for Track 2.

Narrative Format for Track 3: Accelerator Stewardship Test Facility Program

Track 3 awards are considerably shorter in duration and smaller in scope, and consequently have an abbreviated proposal format that is similar to a Track 1 proposal. Track 3 grant applications must not exceed **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. Proposals should clearly explain the technical approach(es) that will be employed and provide ample justification for their feasibility. This section should demonstrate that the proposer 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 4 and an explanation of the requested costs to use these capabilities should be provided in the Budget Explanation.

For each task, provide:

- A general description of its objective;
- A detailed description of the approach to be taken to accomplish it;

- 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 7: 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 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 informal cost sharing being offered (see section III.B).

For Collaborative Track 3 Proposals Only: Each collaborating institution must submit an identical common narrative. The common narrative must identify which tasks and activities will be performed by which of the collaborating institutions in every budget period of the proposed project. The budget and the budget justification—which are unique to each collaborating institution—may refer to parts of the common narrative to further identify each collaborating institution’s activities in the joint project. There should be no ambiguity about each institution’s role and participation in the collaborative group.

The Office of Science will use the multiple applications associated with a collaborative group 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 collaborative group be identical (including the title) with the exception of the budget and budget justification pages.

General Instructions That Apply to Track 1 and Track 3 Proposals

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 include in any section or any appendix of the application any sensitive personally identifiable information (PII) such as a Social Security Number, date of birth, or city of birth. Do

not include information that a merit reviewer should not make use of. Applications containing PII will be declined without review.

APPENDIX 1: BIOGRAPHICAL SKETCH

Provide a biographical sketch for the project director/principal investigator (PD/PI) and each senior/key person listed in Section A on the R&R Budget form.

- Provide the biographical sketch information as an appendix to your project narrative.
- Do not attach a separate file.
- The biographical sketch appendix will not count in the project narrative page limitation.
- The biographical information (curriculum vitae) for each person must not exceed **2** pages when printed on 8.5” by 11” paper with 1 inch margins (top, bottom, left, and right) with font not smaller than 11 point and must include:

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, in chronological order, professional/academic positions with a brief description.

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.

Synergistic Activities: List no more than 5 professional and scholarly activities related to the effort proposed.

Identification of Potential Conflicts of Interest or Bias in Selection of Reviewers: Provide the following information in this section:

- **Collaborators and Co-editors:** List in alphabetical order all persons, including their current organizational affiliation, who are, or who have been, collaborators or co-authors with you on a research project, book or book article, report, abstract, or paper during the 48 months preceding the submission of this application. For publications or collaborations with more than 10 authors or participants, only list those individuals in the core group with whom the Principal Investigator interacted on a regular basis while the research was being done. Also, list any individuals who are currently, or have been, co-editors with you on a special issue of a journal, compendium, or conference proceedings during the 24 months preceding the submission of this application. If there are no collaborators or co-editors to report, state “None.”
- **Graduate and Postdoctoral Advisors and Advisees:** List the names and current organizational affiliations of your graduate advisor(s) and principal postdoctoral sponsor(s). Also, list the names and current organizational affiliations of your graduate students and postdoctoral associates.

Personally Identifiable Information: Do not include sensitive personally identifiable information such as a Social Security Number, date of birth, or city of birth. Do not include information that a merit reviewer should not make use of. Pay particular attention to the content of biographical sketches and curriculum vitae.

This appendix will not count in the project narrative page limitation.

APPENDIX 2: CURRENT AND PENDING SUPPORT

Provide a list of all current and pending support (both Federal and non-Federal) for the Project Director/Principal Investigator(s) (PD/PI) and senior/key persons, including subawardees, for ongoing projects and pending applications. List all sponsored activities or awards requiring a measurable commitment of effort, whether paid or unpaid.

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
- 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 person-months of effort per year being dedicated to the award or activity
- Award period (either actual or expected)
- Include a “Project Abstract”, which includes brief details on the scope of research. A level of detail sufficient to identify similarities and difference with the work presented in the application being submitted is required. Do not simply list the title of the current and/or pending grant.

Provide the Current and Pending Support as an appendix to your project narrative. Concurrent submission of a proposal to other organizations for simultaneous consideration will not prejudice its review.

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

APPENDIX 3: 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 ten 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 proposal. 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 4: FACILITIES & OTHER RESOURCES

This information is used to assess the capability of the organizational resources, including subawardee 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. 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 5: 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 6: DATA MANAGEMENT PLAN

Provide a Data Management Plan (DMP) that addresses 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 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 (<http://science.energy.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 in the additional guidance from the sponsoring program.
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, regulations, and DOE orders and policies. There is no requirement to share proprietary data.

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

- This appendix should not exceed **2** pages including charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard 8.5” by 11” 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.

APPENDIX 7: 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 proposal.

For Track 1 proposals, include in this appendix documents which support the teaming arrangements, intellectual property sharing arrangements, and so on. Examples include letters from subcontractors/consultants indicating availability and expected charges to work on the project, teaming agreements, non-disclosure agreements, IP sharing agreements, etc.



Reviewers may not have time to read extensive appendix materials with the same care they would use with the proposal proper.

- Do not include copies of previously presented and/or published research papers, technical notes, and/or reports written for respective experiments or collaborations. Further, do not include presentations made at any meetings or conferences
- Do not attach a separate file.

- This appendix will not count in the project narrative page limitation.

3. Detailed Instructions for the Budget

Budgets are required for the entire project period. A budget form should be completed for each budget period of the award, and a cumulative budget form for the entire project period will be populated by PAMS. A detailed budget justification narrative should be included after the budget pages. The justification should cover labor, domestic travel, equipment, materials and supplies, and anything else that will be covered with project funds.

To edit a section on the budget, click the edit icon () for each section on the page. Remember to save all budget periods before moving on to the next section. You can save the budget periods by selecting “Save All Budget Periods” from the dropdown on the lower right corner of the PAMS budget entry screen and then clicking the “Go” button. You can also save any data entry page in PAMS using the blue diskette icon () in the floating toolbar on the bottom of the screen.

Section A. Senior/Key Person (Required)

For each Senior/Key Person, enter the appropriate information. List personnel, salary funds, and the number of months that person will be allocated to the project. Also include a written narrative in the budget justification that fully justifies the need for requested personnel.

Section B. Other Personnel

List personnel, salary funds, and the number of months that person will be allocated to the project. Also include a written narrative in the budget justification that fully justifies the need for requested personnel.

Section C. Equipment Description

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. (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. Allowable items ordinarily will be limited to research equipment and apparatus not already available for the conduct of the work. General-purpose office equipment, such as a personal computer, is not eligible for support unless primarily or exclusively used in the actual conduct of scientific research.

Section D. 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 whether travel cost estimates are based upon quotes from travel agencies; upon past experience of similar number of trips to similar travel destinations; or something else (describe). 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.

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. In the budget justification, indicate whether trainee cost estimates are based upon past experience of support of similar number of trainees on similar projects; past experience of support of similar number of participants attending similar conferences/workshops/symposia; or something else (describe).

Section F. Other Direct Costs:

Enter Other Direct Costs information for each item listed.

- **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. In the budget justification, indicate whether cost estimates are based upon past experience of purchase of similar or like items; quotes/catalog prices of similar or like items; or something else (describe).
- **Publication Costs:** Enter the total publication funds requested. 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. In the budget justification, indicate whether cost estimates are based upon past experience of purchase of similar or like items; vendor quotes of similar publication services; or something else (describe).
- **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. In the budget justification, indicate whether consultant cost estimate is based upon previous experience/quotes for similar or like services; or something else (describe).
- **ADP/Computer Services:** Enter total funds requested for ADP/Computer Services. 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. In the budget justification, indicate whether cost estimates are based upon quotes/past experience of purchase of similar computer services; established computer service rates at the proposing institution; or something else (describe).
- **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. In the budget justification, indicate whether cost estimates are based upon past

experience with similar or like items; vendor quotes of similar items; or something else (describe).

- **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 thru F) and will be calculated by PAMS.

Section H. Other Indirect Costs

Enter the Indirect Cost information for each field. Only four general categories of indirect costs are allowed/requested on this form, so please consolidate if needed.

Section I. Total Direct and Indirect Costs

This amount will be calculated by PAMS (Sections G + H)

D. SUBMISSIONS FROM SUCCESSFUL APPLICANTS

If selected for award, DOE reserves the right to request additional or clarifying information.

E. SUBMISSION DATES AND TIMES

1. Letter of Intent Due Date

None.

2. Pre-proposal Due Date

June 15, 2017, at 5 PM Eastern Time

You are encouraged to submit your pre-proposal well before the deadline.

3. Proposal Due Date

July 17, 2017, at 5 PM Eastern Time

You are encouraged to transmit your proposal well before the deadline.

4. Late Submissions

Delays in submitting letters of intent, pre-proposals, and proposals 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 Funding Opportunity Announcement to discuss the option of late submission.

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

F. FUNDING RESTRICTIONS

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

G. OTHER SUBMISSION AND REGISTRATION REQUIREMENTS

1. Where to Submit

Proposals must be submitted through PAMS to be considered for award.

Please only submit a PAMS lab technical proposal in response to this Announcement; do not submit a DOE Field Work Proposal (FWP) at this time. The Office of Science will request FWPs via the Searchable FWP system later from those selected for funding consideration under this Announcement.

2. Registration Process

ONE-TIME REGISTRATION PROCESS

You must complete the one-time registration process (all steps) before you can submit your first proposal through PAMS. Registration instructions appear in the front matter of this Announcement.

For help with PAMS, click the “External User Guide” 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 DOE National Laboratory Program Announcement should reference **LAB 17-**.

3. Proposal Receipt Notices

Upon submission, the PI will receive an email from the PAMS system <PAMS.Autoreply@science.doe.gov> acknowledging receipt of the proposal.

4. Viewing Submitted Proposals

Upon submission, the proposal will appear under My Proposals for the PI and the Submitter with a Proposal Status of “Submitted to DOE”.

Section V - PROPOSAL REVIEW INFORMATION

A. CRITERIA

1. Initial Review Criteria

Prior to a comprehensive merit evaluation, DOE will perform an initial review to determine that (1) the applicant is eligible for the award; (2) the information required by the Program Announcement has been submitted; (3) all mandatory requirements are satisfied; (4) the proposed project is responsive to the objectives of the Program Announcement, and (5) the proposed project is not duplicative of programmatic work. Proposals that fail to pass the initial review will not be forwarded for merit review and will be eliminated from further consideration.

Proposals submitted without a pre-proposal having been previously submitted by the pre-proposal deadline of **June 15, 2017, at 5 PM Eastern Time** will be declined without review.

Proposals submitted after the deadline of **July 17, 2017, at 5 PM Eastern Time** will be declined without review.

2. Merit Review Criteria

Proposals will be subjected to scientific merit review (peer review) and will be evaluated against the following criteria, listed in descending order of importance.

- 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; and
- Reasonableness and Appropriateness of the Proposed Budget.

Merit reviewers will be asked to evaluate stewardship proposals based on an additional criterion:

- Quality of the Accelerator R&D Stewardship Opportunity.

The evaluation process will include program policy factors such as the relevance of the proposed research to the terms of the PA and the agency's programmatic needs. 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 a proposal 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 PROPOSED RESEARCH

- 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?
- Does the proposed work have synergy with the HEP mission?
- Is the Data Management Plan suitable for the proposed research and to what extent does it support the validation of research results?

APPROPRIATENESS OF THE PROPOSED METHOD OR APPROACH

- For Track 1 proposals:
 - Does the plan clearly describe the current technology state, and the technical gaps that must be addressed, to realize the application?
 - Does the proposal clearly describe specific technical milestones that can be used to evaluate the progress of the R&D?
 - Does the Program Plan and Risk Assessment correctly identify the primary risks, and appropriate mitigations for each?
 - If intellectual property protection is required, has a clear plan been spelled out?
 - 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 proposals:
 - Does the proposed effort employ innovative concepts or methods?
 - How logical and feasible are the approaches?
 - Are the conceptual framework, methods, and analyses well justified, adequately developed, and likely to lead to scientifically valid conclusions?
 - Does the applicant recognize significant potential problems and consider alternative strategies?
- For Track 3 proposals:
 - Does the plan clearly describe the current technology state, and the technical advances that will result from the R&D?
 - Does the proposal clearly describe specific technical milestones that can be used to evaluate the progress of the R&D?
 - 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?

COMPETENCY OF APPLICANT'S PERSONNEL AND ADEQUACY OF PROPOSED RESOURCES

- Does the proposed work take advantage of unique facilities and capabilities?
- What is the past performance of the leading members of the collaboration?

- Are the proposed plans for recruiting any additional scientific and/or technical personnel including new senior staff, students and postdocs reasonable, justified, and appropriate?
- Are the environment and facilities adequate for performing the proposed effort?
- 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?
- Additional questions for Track 1 proposals:
 - Does the Teaming and Management Plan clearly define the roles and responsibilities of all key participants?
 - 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?
- Additional questions for Track 2 proposals:
 - No additional questions.
- Additional questions for Track 3 proposals:
 - Does the Teaming and Management Plan clearly define the roles and responsibilities of all key participants?
 - 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?
 - Is the proposed work an effective use of DOE National Laboratory resources?
 - Are you aware of specific private sector resources that could be used to accomplish this R&D instead?

REASONABLENESS AND APPROPRIATENESS OF THE PROPOSED BUDGET

- 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?
- Additional questions for Track 1 and Track 3 proposals:
 - Has the applicant listed informal cost sharing?
 - Does the amount and type of informal cost sharing provide evidence of substantial material participation and risk sharing by the institution?

AS INDICATED ABOVE, THE FOLLOWING QUESTIONS ARE ALSO PROVIDED TO MERIT REVIEWERS WHEN EVALUATING THE ADDITIONAL CRITERION:

QUALITY OF THE ACCELERATOR R&D STEWARDSHIP OPPORTUNITY

In the questions that follow, the term “Stewardship customer” is used broadly to refer to the

entity (other than HEP) whose mission or research objectives encompass the proposed work. The Stewardship customer can be another Office of Science (e.g., BES, NP, FES), another DOE program office (e.g., NNSA, EERE, ARPA-E) another federal agency (e.g., NIH, DoD), or industries that use accelerator technology.

- Does the proposed work require significant scientific or technical advances in accelerators or accelerator-related 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 Stewardship customer's needs **and** result in some synergy with the HEP mission? (synergies might include: developing additional expertise or facilities relevant to present or future HEP-supported work).
- 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 activity? Are other entities capable of providing a substantially similar (or superior) capability?
- What evidence is there that the Stewardship customer endorses the goal? Does this proposal address issues that have been identified in writing (e.g., advisory committee reports, workshop reports, white papers, roadmaps) by the Stewardship customer? Does the Stewardship customer participate substantially and materially in this effort (e.g., by co-funding, cost-sharing, in-kind donation or equipment, donation of effort)?

B. REVIEW AND SELECTION PROCESS

1. Merit Review

Proposals that pass the initial review will be subjected to a formal merit review and will be evaluated based on the criteria above.

2. Selection

The Selection Officials will consider the following items, listed in order of decreasing significance:

- Scientific and technical merit of the proposed activity as determined by merit review, using the criteria set out in Section V.A.2;
- The advice of other federal agencies with specific expertise and interest in the accelerator R&D topics listed in this solicitation:
 - At the pre-application phase, and again
 - At the application review phase;
- Availability of funds;
- Amount of institutional commitment offered;
- Relevance of the proposed activity to Office of Science priorities, as commented on by merit reviewers;
- Ensuring an appropriate balance of activities within Office of Science programs;

- Previous performance;
- 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 the DOE Office of Science specifically, and other federal agencies generally, to conduct their missions;
 - Enhance the accelerator technology capabilities and economic competitiveness of U. S. industry;
 - Foster collaboration between developers of accelerator technology and experts who apply accelerator technology;
- Degree to which the proposed work is synergistic with, but not duplicative of, existing awards;
- Other available advice and information.

3. Discussions and Award

The Government may enter into discussions with a selected applicant for any reason deemed necessary. Failure to resolve satisfactorily the issues identified by the Government will preclude award to the applicant.

C. ANTICIPATED NOTICE OF SELECTION AND AWARD DATES

DOE is striving to make awards within six months of the receipt of proposals.

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 proposals have not been selected will be advised as promptly as possible. This notice will explain why the proposal was not selected.

2. Notice of Award

A work authorization/contract modification issued by the contracting officer is the authorizing award document.

B. REPORTING

Annual progress reports from the award investigator will be required and will be due 90 days before the end of each budget year.

Section VII - QUESTIONS/AGENCY CONTACTS

A. QUESTIONS

For help with PAMS, click the “External User Guide” 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 DOE National Laboratory Program Announcement should reference LAB 17-.

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 DOE National Laboratory Program Announcement or below.

Please contact the program staff with all questions not directly related to the PAMS system.

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
Administrative Contact	For questions about non-technical matters, including program rules, please contact sc.hepfoa@science.doe.gov
Program Manager Scientific Contact	For questions about specific program areas and/or technical requirements, please contact Eric.Colby@science.doe.gov

Section VIII - OTHER INFORMATION

A. MODIFICATIONS

Notices of any modifications to this DOE National Laboratory Announcement will be posted on the Grants and Contracts website (<http://science.energy.gov/grants/>).

B. GOVERNMENT RIGHT TO REJECT OR NEGOTIATE

DOE reserves the right, without qualification, to reject any or all proposals received in response to this DOE National Laboratory Announcement and to select any proposal, in whole or in part, as a basis for negotiation and/or award.

C. COMMITMENT OF PUBLIC FUNDS

The Contracting Officer is the only individual who can make awards or commit the Government to the expenditure of public funds. A commitment by other than the Contracting Officer, either explicit or implied, is invalid.

D. PROPRIETARY PROPOSAL INFORMATION

Patentable ideas, trade secrets, proprietary or confidential commercial or financial information, disclosure of which may harm the applicant, should be included in a proposal 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 the project narrative and specifies the pages of the proposal which are to be restricted:

“The data contained in pages _____ of this proposal have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes.”

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.”

E. 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 proposal, consents to the use of non-Federal reviewers/administrators. Non-Federal reviewers must sign a conflict of interest agreement prior to reviewing a proposal. Non-Federal personnel conducting administrative activities must sign a non-disclosure agreement.

F. 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 Contracting Officer for this award and until the awardee receives notice of such availability, to be confirmed in writing by the Contracting Officer.