

**PROGRAM ANNOUNCEMENT  
TO DOE NATIONAL LABORATORIES**



**U. S. Department of Energy  
Office of Science  
Advanced Scientific Computing Research**

**SDN-Enabled Terabits Optical Networks for Extreme-Scale Science**

**Lab Announcement Number: LAB 15-1295**

<b>Issue Date:</b>	<b>May 20, 2015</b>
<b>Letter of Intent Due Date:</b>	<b>June 05, 2015 at 5:00 PM ET (A Letter of Intent is Encouraged)</b>
<b>Pre-Application Due Date:</b>	<b>Not Applicable</b>
<b>Application Due Date:</b>	<b>July 2, 2015 at 5:00 PM ET</b>

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## **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](mailto: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](mailto:sc.pams-helpdesk@science.doe.gov). All submission and inquiries about this DOE National Laboratory Announcement should reference LAB 15 - 1295.

## 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 before the deadline.

## **Section I – DOE NATIONAL LABORATORY OPPORTUNITY DESCRIPTION**

### **GENERAL INQUIRIES ABOUT THIS ANNOUNCEMENT SHOULD BE DIRECTED TO:**

#### **Technical/Scientific Program Contacts:**

Dr. Thomas Ndousse-Fetter

Phone: 301-903-9960

[Thomas.Ndousse-Fetter@science.doe.gov](mailto:Thomas.Ndousse-Fetter@science.doe.gov)

### **SUMMARY**

The Office of Advanced Scientific Computing Research (ASCR) in the Office of Science at the US Department of Energy (DOE) hereby announces its intent to receive proposals to develop a new generation of intelligent terabit optical network capabilities that will enable new modalities of network-intensive science. Networks have emerged as indispensable infrastructures for distributed science and are becoming too complicated to manage and control, especially as they provide critical support for sophisticated distributed extreme-scale science activities and BigData-intensive scientific collaborations. The specific focus of this Laboratory Announcement is on addressing this complexity with intelligent and automated technologies that simplify network usage for scientists, automate complex network control and management functions, and improve the productivity and performance of network-intensive science. This Laboratory Announcement will accept proposals that achieve the above objectives by leveraging the emerging technologies such as Software Defined Networks (SDN), Network Function Virtualization (NFV), and Network Service Chaining (NSC), as well as recent advances in related fields such as machine learning and parallel computing.

### **SUPPLEMENTARY INFORMATION**

The mission of the ASCR program is to advance applied mathematics and computer science; to deliver, in partnership with disciplinary science, the most advanced computational scientific applications; to advance computing and networking capabilities; and to develop, in partnership with U.S. industry, future generations of computing hardware and tools for science. A major objective of the ASCR's basic research portfolio is to enable DOE-mission science applications to take full advantage of computing and communication network technologies to improve scientific productivity. As DOE's science mission increasingly depends on networks to support BigData-intensive science, real-time access to complex scientific instruments, and large national and international collaborations, concerns have arisen about current best-effort network technologies that have remained unchanged for almost two decades, despite extraordinary advances in computing technologies. Today's networks are very complex, are statically configured, and are built with closed proprietary technologies that hinder innovations. The focus of this Laboratory Announcement is on a new generation of SDN-enabled High Performance Networks (SDN-HPON) that are agile, open to rapid innovations, and dynamically reconfigurable with automated and intelligent capabilities.

SDN is an emerging networking paradigm that promises to deliver enormous benefits, from reducing the complexities of network traffic control and management to enabling the design of agile networks that are adaptive to changing application requirements. SDN's principal and most attractive feature is a programmable network operating system obtained through a separation of the control from the data plane. With programmability, network innovations, which were previously hindered by proprietary vendor software locked in routers and switches, are now possible. This feature, along with related enabling technologies such as NFV and NSC, should be exploited by grant applicants to develop automated network capabilities and smart middleware services that enable a new generation of network-intensive science. DOE's vision for an SDN-HPON, as articulated in this Laboratory Announcement, broadly describes a software defined high-performance network ecosystem that emphasizes end-to-end capabilities at the application and network levels. This ecosystem is a collection of software-controlled high-performance networks, Storage Area Networks (SANs), Local Area Networks (LANs), and Wide Area Networks (WANs), to which network-intensive scientific workloads can be dynamically assigned based on application characteristics, best-available network resources, and service level agreements. In the context of this Laboratory Announcement, an SDN-HPON ecosystem has capabilities and requirements that far outstrip conventional SDN networks optimized for Internet applications. Its distinguishing features include the following:

- a) Multi-domain network capabilities including guaranteed on-demand services optimized for high-end scientific applications;
- b) Terabits/sec capacity in the optical backbone network and the ability to deliver at least 40-100 Gbps end-to-end performance to network-intensive applications;
- c) Embedded network intelligence and automation in the design of critical functions and services to reduce complexities for both end users and network operators.

Grant applicants must ensure that the above features are addressed in their grant application regardless of their proposed topics. Potential technical areas of interest include, but are not limited to, the following three major technical areas:

**a) SDN-HPON Control Plane Architecture and Protocols**

The potential deployment of SDN controllers across a wide range of heterogeneous network systems such as SANs, LANs, and WANs poses major controller design challenges, especially if it involves multiple controllers in a single or in multiple autonomous network domains. The controller designs may be further complicated if these networks are multi-layered and designed with different types of transport network technologies. Grant applications are sought to address the challenges of SDN deployment in large-scale networks. Specific areas of interest include but are not limited to the following: a) intra-domain/inter-domain SDN controller architectures requiring multiple controllers; b) controller placement and optimum number of controllers in large networks; c) SDN network survivability, which covers self-healing, fault-tolerance, and recovery mechanisms for central controllers; d) multi-domain/multi-layer SDN services such as global topology discovery, inter-domain centralized path computation and other capabilities that extend or leverage Traffic Engineering (TE) frameworks, such as MPLS-TE (Multi-Protocol Lambda Switching), GMPLS (Generalized MPLS), OSCARS-TE (On-demand Secure Circuits and Advance Reservation System)-TE. Grant applicants may also focus on a unified approach to Southbound APIs that extend or leverage OpenFlow standards to accommodate different data

planes or transport technologies such as packet switching, dynamic virtual circuits, and/or optical Flex-Grid.

**b) Intelligent Services for SDN-HPON and Network-intensive Applications**

The key to realizing the promise of SDN lies in the ability to harness controller programmability, which enables automation and the development of intelligent services to dynamically control the behavior of networks and applications. In extreme-scale science environments, these capabilities will make it possible for network-intensive application workflows to dynamically interact with the network fabric through northbound open APIs, some of which are yet to be defined and standardized. For example, an application workflow agent should be able to dynamically negotiate bandwidth with resource brokers in response to the network state or performance of the application. In another example, it is possible, with NSC, for a controller security agent to selectively direct only suspect traffic flows to a special intrusion detection server through secure tunnels. Grant applications are sought to exploit SDN programmability in the development of automated controller services, northbound APIs, and network-aware workflow services to enable network-intensive applications to dynamically interact with networks. These may include but are not limited to a) intelligent bandwidth and storage system resource brokers; b) dynamic end-to-end carrier-class service orchestrators; c) QoS-based network and storage resource virtualization for efficient resource allocation and utilization; and e) smart middleware for data movement, including provisioning mechanisms for Data Transfer Node (DTN) used for ultra-high-speed data transfers.

**c) Advanced Deployment of End-to-End SDN-HPON**

The focus of this element of the Laboratory Announcement is on large pilot projects or advanced deployment projects designed to demonstrate and validate the end-to-end capabilities of an SDN-HPON in a scientific research environment. Such an effort might require the development or emulation of SDN middleware and services that are not included in the first generation of SDN-enabled devices. The advanced deployment environment should include the following: a) multiple controllers and multiple autonomous network domains that include a WAN and LAN federation with heterogeneous data planes (packet and dynamic virtual circuits); and b) at least two high-end data transfer nodes. Grant applicants are encouraged to propose an end-to-end SDN-HPON pilot project that leverages existing experimental networks or testbeds deployed in national laboratories and in research and educational networks such as ESnet, Internet2, and regional networks. The participation of vendors willing to commit resources to the project for the duration of a potential award is also encouraged. Funding for capital equipment will be very limited. Grant applicants are encouraged to seek research collaboration with vendors or labs that can provide the necessary equipment needed for the project.

**Out of Scope Topics**

General network R&D topics such TCP extensions, SDN-enabled wireless networking, cloud computing networking, traditional network security, and best-effort data movement middleware are out of scope for this Laboratory Announcement.

## Research outcomes

The outcome of each research effort must be clearly described. This Laboratory Announcement anticipates three major categories of research and development outcomes: a) rigorous peer-review journal publications in the form of contribution to the literature in the field of the subject matter, b) open source software available to research and education networking (R&E) communities and c) software research prototypes to verify and validate a major protocol, architecture, or networking concepts delivered to national labs and R&E communities.

## References

- [1] ASCR Intelligent Optical Network Infrastructure Workshop, August 2014.  
<http://www.orau.gov/ioninfrastructure2014/default.htm>
- [2] McKeown, N.; Anderson, T.; Balakrishnan, H.; Parulkar, G.; Peterson, L.; Rexford, J.; Shenker, S.; Turner, J. OpenFlow: Enabling Innovation in Campus Networks. ACM SIGCOMM Comput. Communications. Rev. 2008, 38, 69–74.
- [3] Steven Gringeri, Nabil Bitar, and Tiejun J. Xia – Verizon Laboratories, Extending Software Defined Network Principles to Include Optical Transport, IEEE Communications Magazine, Vol 51, issue No. 3, P32-40, 2013.
- [4] Saurav Das, Yiannis Yiakoumis, Guru Parulkar, Nick McKeown, Application-Aware Aggregation and Traffic Engineering in a Converged Packet-Circuit Network, Published in Optical Fiber Communication Conference and Exposition (OFC/NFOEC), 2011 and the National Fiber Optic Engineers Conference, p 1-3.
- [5] Wolfgang John\*, Kostas Pentikousis ET AL., [Research Directions in Network Service Chaining](#)
- [6] Francisco J. Ros C, and Pedro M. Ruiz, [Five Nines of Southbound Reliability in Software-Defined Networks](#)
- [7] Mehmet Ulema, Manhattan College, Vulnerabilities and Opportunities in SDN, NFV, and NGSON
- [8] Henrique Rodrigues, Inder Monga, et al., [Traffic Optimization in Multi-Layered WANs using SDN](#)
- [9] An introduction to PCE-based control plane architecture, its operational advantages, including full traffic engineering of inter-domain paths, and how it delivers SDN, in <http://www.metaswitch.com/sites/default/files/metaswitch-white-paper-pce-an-evolutionary-approach-to-sdn.pdf>
- [10] Ericson: [Software-defined networking: the service provider perspective](#)

## Collaboration

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

- Each proposal must contain a correct cover page for the submitting institution only.
- Each proposal must contain a unique budget corresponding to the expenditures for that proposal's submitting institution only.

- Each proposal must contain a unique budget justification corresponding to the expenditures for that proposal's submitting institution only.

Our intent is to create from the various proposals associated with a collaborative group one document for merit review that consists of the common, identical proposal materials combined with a set of detailed budgets from the partner institutions. Thus, it is very important that every proposal in the collaborative group be identical (including the title) with the exception of the budget and budget justification pages.

Collaborative proposals from institutions other than DOE National Laboratories should be submitted following the above rules in response to the companion FOA, **DE-FOA-001295**. Each application within the collaborative group submitted in response to an FOA, 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.

## **Section II – AWARD INFORMATION**

### **A. TYPE OF AWARD INSTRUMENT**

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

DOE will consider funding multi-institution collaborations under this Laboratory Announcement.

### **B. ESTIMATED FUNDING**

It is anticipated that approximately \$5,000,000 per year will be available under this Laboratory Announcement and the companion Funding Opportunity Announcement (FOA), DE-FOA-001295, contingent on satisfactory peer review and the availability of appropriated funds. Applicants should request project support for three years. Following the first year award, out-year support will be contingent on the availability of appropriated funds, progress of the research, and programmatic needs. Awards are expected to begin in fiscal year 2015.

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

### **C. MAXIMUM AND MINIMUM AWARD SIZE**

The award size will depend on the availability of appropriated funds.

#### **Ceiling**

- a) Single investigator/single laboratory \$350,00/year
- b) Medium multiple investigators/multiple institutions: \$800,000 per year
- c) Large multiple investigators/multiple institutions: \$1,200,000 per year

#### **Floor**

None

### **D. EXPECTED NUMBER OF AWARDS**

Approximately 8 - 10 single investigator awards and 2 – 3 multiple investigator awards are expected to be made.

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

### **E. ANTICIPATED AWARD SIZE**

It is anticipated that award sizes may be 1) up to \$350,000/year single investigator/single

laboratory, 2) up to \$800,000 per year for medium size multiple investigators and multiple institutions, and 3) up to \$1,200,000 per year for large multiple investigators and multiple institutions.

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

#### **F. PERIOD OF PERFORMANCE**

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

#### **G. TYPE OF PROPOSAL**

DOE will accept new DOE National Laboratory Proposals under this 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 Laboratory Announcement.

#### **B. COST SHARING**

Cost sharing is not required.

#### **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**

LETTER OF INTENT DUE DATE

**June 05, 2015, by 05:00 PM Eastern Time**

RESPONSE DATE

**June 10, 2015**

A Letter of Intent is encouraged and must be submitted by **June 05, 2015, by 05:00 PM Eastern Time**.

The LOI is to help in planning the review and the selection of potential reviewers for the proposal. For this purpose, the LOI must include the following:

- A cover sheet containing the name and mailing address of the sponsoring institution; the planned title of the research proposal; the name, e-mail address, and telephone number of the Principal Investigator, additional Senior Investigator(s), and Senior/Key personnel expected to be involved in the planned proposal.

The absence of a LOI will not negatively affect a thorough evaluation of a responsive full proposal submitted in a timely fashion.

The LOI must be submitted electronically through the DOE Office of Science Portfolio Analysis and Management System (PAMS) website <https://pamspublic.science.energy.gov/>. It is important that the LOI be a single file with extension .pdf, .docx, or .doc. The Principal Investigator (PI) and anyone submitting on behalf of the PI must register for an account in PAMS before it will be possible to submit a letter of intent. **All PIs and those submitting LOIs 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 Letter of Intent:**

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

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

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](mailto:sc.pams-helpdesk@science.doe.gov). All submission and inquiries about this Laboratory Announcement should reference LAB 15 - 0001295

## 2. Pre-proposal

PRE-PROPOSAL DUE DATE

N/A.

ENCOURAGE/DISCOURAGE DATE

N/A

Pre-proposals will be reviewed for responsiveness of the proposed work to the research topics identified in this Laboratory Announcement. DOE will send a response by email to each applicant encouraging or discouraging the submission of a full proposal by xx. Applicants who have not received a response regarding the status of their preproposal by this date are responsible for contacting the program to confirm this status.

**Only those applicants that receive notification from DOE encouraging a full proposal may submit full proposals.** No other full proposals will be considered.

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  
Laboratory Announcement Number: N/A

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

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. For each funded investigator, provide a list of collaborative co-investigators including co-authors of the past 48 months, co-editors of the past 24 months, graduate and postdoctoral advisors/advisees, and close associations.

Those pre-proposals that are encouraged will be used to help the Office of Science begin planning for the full proposal peer review process. The intent of the Office of Science in discouraging submission of certain full proposals is to save the time and effort of applicants in preparing and submitting full 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](mailto: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](mailto: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](mailto:sc.pams-helpdesk@science.doe.gov). All submission and inquiries about this DOE Laboratory Announcement should reference **LAB 15-1295**.

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 2, 2015 at 5:00 PM Eastern Time** or See Section IV, Part E.

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

At most two letters of support for each single investigator project and one per participating institution for multiple investigators projects

### 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 – **20 page limit**)
  - 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: 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](mailto:sc.pams-helpdesk@science.doe.gov). All submissions and inquiries about this Laboratory Announcement should reference LAB 15-1295. Full proposals submitted in response to this Laboratory Announcement must be submitted to PAMS no later than **July 2, 2015, at 5:00 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](mailto: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](mailto:sc.pams-helpdesk@science.doe.gov). All submissions and inquiries about this Laboratory Announcement should reference **LAB 15-001295**.

## 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 (NO MORE THAN ONE PAGE)

The project summary/abstract must contain a summary of the proposed activity suitable for dissemination to the public. It should be a self-contained document that identifies the name of the applicant, the Principal Investigator (PI), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (i.e., benefits, outcomes). This document must not include any proprietary or sensitive business information as the Department may make it available to the public. 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. The one-page project summary/abstract should be placed in a separate, single pdf document and attached on the appropriate screen in PAMS.

The abstract may be used to prepare publicly accessible reports about DOE-supported research.

### DOE COVER PAGE (PART OF PROJECT NARRATIVE)

The following proposal cover page information may be placed on a plain page. No form is required. This cover page will not count in the project narrative page limitation.

- The project title:
- Applicant/Institution:
- Street Address/City/State/Zip:
- Postal Address:
- Administrative Point of Contact name, telephone number, email:
- Lead PI name, telephone number, email:
- DOE National Laboratory Announcement Number: **LAB 15 - 0001295**
- DOE/Office of Science Program Office: **Advanced Scientific Computing Research**
- DOE/Office of Science Program Office Technical Contact: Dr. Thomas Ndousse-Fetter
- PAMS Letter of Intent Tracking Number:

- Research area (site) identified in Section I of this Announcement

COVER PAGE SUPPLEMENT FOR COLLABORATIONS  
(PART OF PROJECT NARRATIVE ATTACHED TO FIELD 8 ON THE FORM)

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

- Each proposal must contain the correct “cover-page” information for the submitting institution only.
- Each proposal must contain a unique budget corresponding to the expenditures for that proposal’s submitting institution only.
- Each proposal must contain a unique budget justification corresponding to the expenditures for that proposal’s submitting institution only.

The Office of Science will use the multiple proposals associated with a collaborative group to create one consolidated document for merit review that consists of the common, identical proposal materials combined with a set of detailed budgets from the partner institutions. It is very important that every proposal in the collaborative group be identical (including the title) with the exception of the budget and budget justification pages.

If the 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.
- 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.

	<b>Names</b>	<b>Institution</b>	<b>Year 1 Budget</b>	<b>Year 2 Budget</b>	<b>Year 3 Budget</b>	<b>Total Budget</b>
Lead PI						
Co-PI						
Co-PI						
Co-PI						

Example budget table (\$ in thousands)

\* Note that collaborating proposals must be submitted separately.

#### PROJECT NARRATIVE (NO MORE THAN 20 PAGES LONG)

The project narrative **must not exceed 20 pages** 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.

Do not include any Internet addresses (URLs) that provide supplementary or additional information that constitutes a part of the proposal. Merit reviewers are not required to access Internet sites; however, Internet publications in a list of references will be treated identically to print publications. See Part VIII.D for instructions on how to mark proprietary proposal information. To attach a Project Narrative, click “Add Attachment.”

**Background/Introduction:** Explanation of the importance and relevance of the proposed work as well as a review of the relevant literature.

**Proposed Research and Methods:** Identify the hypotheses to be tested (if any) and details of the methods to be used including the integration of experiments with theoretical and computational research efforts.

**Timetable of Activities:** Timeline for all major activities including milestones and deliverables.

**Project Management Plan:** Multi-institutional proposals must include a project management plan that clearly indicates the roles and responsibilities of each organization and indicates how activities will be coordinated and communicated among team members.

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

The Project Narrative comprises the research plan for the project. It should contain enough background material in the Introduction, including review of the relevant literature, to demonstrate sufficient knowledge of the state of the science. The major part of the narrative should be devoted to a description and justification of the proposed project, including details of the method to be used. It should also include a timeline for the major activities of the proposed project, and should indicate which project personnel will be responsible for which activities. There should be no ambiguity about which personnel will perform particular parts of the project, and the time at which these activities will take place.

Do not include any Internet addresses (URLs) that provide supplementary or additional information that constitutes a part of the proposal. Using Internet sites in an attempt to avoid

page limits will fail: The content of those sites will not be reviewed. See Part VIII.D for instructions on how to mark proprietary proposal information.

**For Collaborative Proposals Only:** Each collaborating institution must submit an identical common narrative. Collaborative proposals will necessarily be longer than single-institution proposals. The common narrative may exceed the page limit described for the research narrative by 50%; i.e., if the page limit is 12 pages, a collaboration is subject to a limit of 18 pages. 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 proposals associated with a collaborative group to create one consolidated document for merit review that consists of the common, identical proposal materials combined with a set of detailed budgets from the partner institutions. It is very important that every proposal in the collaborative group be identical (including the title) with the exception of the budget and budget justification pages.

#### APPENDIX 1: BIOGRAPHICAL SKETCH

Provide a biographical sketch for the project director/principal investigator (PD/PI) and each senior/key person as an appendix to your technical narrative. As part of the sketch, provide information that can be used by reviewers to evaluate the PI’s potential for leadership within the scientific community. Examples of information of interest are invited and/or public lectures, awards received, scientific program committees, conference or workshop organization, professional society activities, special international or industrial partnerships, reviewing or editorship activities, or other scientific leadership experiences. The biographical information (curriculum vitae) must not exceed 3 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 the following:

**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. An abbreviated style such as the Physical Review Letters (PRL) convention for citations (list only the first author) may be used for publications with more than 10 authors.

**Synergistic Activities:** List no more than 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 proposal. 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 proposal. 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 consider.

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 lead principal investigator and each principal investigator, including subawardees, for ongoing projects and pending proposals. For each organization providing support, show the total award amount for the entire award period (including indirect costs) and the number of person-months per year to be devoted to the project by the PI. Include the award number, title of the funded research project, and the name of the PI for the project. Briefly describe the research being performed and explicitly identify any overlaps with the proposed research.

Provide the Current and Pending Support as an appendix to your project narrative. Concurrent submission of an 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 5 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. Reviewers are not required to consider information in this appendix.

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

### **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: June 05, 2015**

You are encouraged to submit your Letter of Intent well before the deadline.

### **2. Pre-application Due Date:**

N/A

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

### **3. Application Due Date: July 2, 2015**

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

### **4. Late Submissions**

All applications received after the deadline will be automatically declined.

## **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.

**Cost of major equipment such as router and switches will not be allowed.**

## **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](mailto:sc.pams-helpdesk@science.doe.gov). All submission and inquiries about this Laboratory Announcement should reference **LAB 14-1139**.

### **3. Proposal Receipt Notices**

Upon submission, the PI will receive an email from the PAMS system <[PAMS.Autoreply@science.doe.gov](mailto: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 Laboratory Announcement has been submitted; (3) all mandatory requirements are satisfied; (4) the proposed project is responsive to the objectives of the Laboratory 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.

#### 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.
- Impact of the Proposed Work

The evaluation process will include program policy factors such as the relevance of the proposed research to the terms of the Laboratory Announcement 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 an application constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

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

#### SCIENTIFIC AND/OR TECHNICAL MERIT OF THE PROPOSED RESEARCH

- What is the unique scientific and technical innovation of the proposed research?
- Are there basic theories, algorithms, and rigorous formalism in the proposed work that can be used to validate the research outcomes?
- How does the proposed work compare with similar efforts by other researchers, both in terms of scientific and/or technical merit and originality?
- 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

- How logical and feasible are the research approaches?
- Does the proposed research employ innovative concepts or methods?
- 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?
- Has the applicant defined the metrics for evaluating the project's success, risks, milestones?
- What is the likelihood of achieving valuable results with the proposed resources and technical personnel?

#### COMPETENCY OF APPLICANT'S PERSONNEL AND ADEQUACY OF PROPOSED RESOURCES

- What is the past performance and potential of the Principal Investigators (PIs)?
- How well qualified is the research team to carry out the proposed research?
- Are the research environment and facilities adequate for performing the research?
- Does the proposed work take advantage of networking resources and capabilities available in the DOE science community?

#### REASONABLENESS AND APPROPRIATENESS OF THE PROPOSED BUDGET

- Are the proposed budget and staffing levels adequate to carry out the proposed research?
- Is the budget reasonable and appropriate for the scope?

#### IMPACT OF THE PROPOSED WORK

- Will the outcome of the proposed work have a direct impact on network infrastructures serving the scientific community?
- Will the proposed work make a significant contribution to existing network literature and standard?

## **B. REVIEW AND SELECTION PROCESS**

### **1. Merit Review**

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

## **2. Selection**

The Selection Officials will consider the following items, listed in no order of significance:

- Scientific and technical to intelligent high-performance networking serving the science community;
- Availability of funds;
- The extent to which the proposed work addresses intelligent and automated networking capabilities, 40-100 Gbps network technologies, and the leveraging of emerging technologies (SDN, NFV, NSC, etc.);
- Relevance and a broad applicability of the proposed research results to networks infrastructures serving the science community;
- Performance of the applicants in previous and related funded activities by the subprogram issuing this Laboratory Announcement.

## **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**

It is anticipated that the award selection will be completed by 08/10/2015. It is expected that awards will be made in Fiscal Year 2015.

DOE is interested in seeing projects supported under this Laboratory Announcement begin work by 09/01/2015.

## **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](mailto:sc.pams-helpdesk@science.doe.gov). All submission and inquiries about this Laboratory Announcement should reference LAB 15 – 0001295.

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 Laboratory Announcement or below.

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

### B. AGENCY CONTACTS

PAMS Customer Support	855-818-1846 (toll-free) 301-903-9610 <a href="mailto:sc.pams-helpdesk@science.doe.gov">sc.pams-helpdesk@science.doe.gov</a>
Program Manager Scientific Contact	Dr. Thomas Ndousse-Fetter 301-903-9960 <a href="mailto:Thomas.Ndousse-Fetter@science.doe.gov">Thomas.Ndousse-Fetter@science.doe.gov</a>

## **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 conflict of interest and non-disclosure agreements 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.