

**FINANCIAL ASSISTANCE
FUNDING OPPORTUNITY ANNOUNCEMENT**



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

**Uncertainty Quantification Methodologies for
Enabling Extreme-Scale Science**

**Funding Opportunity Number: DE-FOA-0000895
Announcement Type: Initial
CFDA Number: 81.049**

Issue Date: April 3, 2013

**Pre-Application Due Date: April 24, 2013 at 5:00 PM Eastern Time
(Pre-Applications are Required)**

Application Due Date: May 24, 2013 at 5:00 PM Eastern Time

REGISTRATIONS

Required Registrations

There are several one-time actions you must complete in order to submit an application in response to this Announcement. Applicants not currently registered with SAM and Grants.gov should allow **at least 44 days** to complete these requirements. You are encouraged to start the process as soon as possible.

Applicants must obtain a DUNS number at <http://fedgov.dnb.com/webform>.

Applicants must register with the System for Award Management (SAM) at <http://www.sam.gov/>. If you had an active registration in the Central Contractor Registry (CCR), you should have an active registration in SAM. More information about SAM registration for applicants is found at [https://www.sam.gov/sam/transcript/Quick Guide for Grants Registrations v1.7.pdf](https://www.sam.gov/sam/transcript/Quick%20Guide%20for%20Grants%20Registrations%20v1.7.pdf).

Applicants must register with Grants.gov. There are 3 steps to this process.

1. The Authorized Organizational Representative (AOR) must register at: <https://apply07.grants.gov/apply/OrcRegister>
2. An email is sent to the E-Business (E-Biz) POC listed in SAM. The E-Biz POC must approve the AOR registration using their MPIN from their SAM registration.
3. AOR verifies that registration was completed at: http://grants.gov/applicants/applicant_profile.jsp.

More information about the above steps is provided at:

http://www.grants.gov/applicants/organization_registration.jsp.

Applicants must register with FedConnect at www.fedconnect.net. If an award is made, the full and binding version of the assistance agreement between your institution and DOE will be posted to FedConnect.

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

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

Many functions for grants and cooperative agreements with the DOE Office of Science are performed in the Portfolio Analysis and Management System (PAMS), which is available at <https://pamspublic.science.energy.gov>.

Preapplications and letters of intent are submitted through PAMS. Formal grant applications are submitted through grants.gov, which will transfer the application into PAMS. This solicitation is available through grants.gov, fedconnect.net, and PAMS. You will receive various notifications from PAMS during the application receipt and review process. 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. Additional functionalities will be added to PAMS in the near future. You must register in PAMS to submit a pre-application or a letter of intent.

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

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.

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. (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.
- If, after searching, you think your institution is not currently in the database, click the “Cannot Find My Institution” button and enter the requested institution information into PAMS. Click the “Create Institution” button. PAMS will add the institution to the system, associate your profile with the new institution, and return you to the “Institutions – List” page when you are finished.

For help with PAMS, click the “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 Funding Opportunity Announcement (FOA) should reference **DE-FOA-0000895**.

Questions

Questions relating to the registration process, **system requirements, or how an application form works** must be directed to Grants.gov at 1-800-518-4726 or support@grants.gov.

Application Preparation and Submission

Applicants must download the application package, application forms and instructions, from Grants.gov at <http://www.grants.gov/> (Additional instructions are provided in Section IV A of this FOA.)

Where to Submit

Applications must be submitted through Grants.gov to be considered for award. You cannot submit an application through Grants.gov unless you are registered. Please read the registration requirements carefully and start the process immediately. Remember you have to update your SAM registration annually. If you have any questions about your registration, you should contact the Grants.gov Helpdesk at 1-800-518-4726 to verify that you are still registered in Grants.gov.

IMPORTANT NOTICE TO POTENTIAL APPLICANTS: When you have completed the process, you should call the Grants.gov Helpdesk at 1-800-518-4726 to verify that you have completed the final step (i.e., Grants.gov registration).

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Section I – FUNDING OPPORTUNITY DESCRIPTION

GENERAL INQUIRIES ABOUT THIS FOA SHOULD BE DIRECTED TO:

Technical/Scientific Program Contact:

Dr. Steven L. Lee

Office of Advanced Scientific Computing Research

Phone: 301-903-5710

Email: steven.lee@science.doe.gov

STATUTORY AUTHORITY

Public Law 95-91, US Department of Energy Organization Act

Public Law 109-58, Energy Policy Act of 2005

APPLICABLE REGULATIONS

U.S. Department of Energy Financial Assistance Rules, codified at 10 CFR 600

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

SUMMARY

The Advanced Scientific Computing Research (ASCR) program of the Office of Science (SC), U.S. Department of Energy (DOE), hereby invites applications for basic mathematical, statistical and computational research that significantly advances uncertainty quantification methodologies for enabling extreme-scale science.

The mission of the DOE Office of Science is the delivery of scientific discoveries, capabilities and major scientific tools to transform the understanding of nature and to advance the energy, economic, and national security of the United States. The next level of scientific discovery will be enabled by research developments that can effectively harness significant or disruptive changes in computing technologies and also build up the requisite mathematical and statistical foundations for confidently using advanced computational approaches to pursue scientific investigations and breakthroughs. Short-range scientific computing agendas look ahead to carrying out DOE-mission research on multi- and many-core, high-performance computing systems. Future extreme-scale scientific computing targets a thousand-fold increase in today's capabilities with only a modest increase in power requirements. Long-range ASCR basic research seeks to anticipate the next paradigm shifts in developing the modeling, simulation, and analysis capabilities for achieving DOE-mission goals using extreme-scale scientific computing in conjunction with theory, experiments, observations, or other relevant resources.

The purpose of this FOA is to invite applications in ASCR Applied Mathematics basic research that significantly advance uncertainty quantification (UQ) methodologies as an enabling technology in extreme-scale scientific computing. UQ broadly refers to the end-to-end study of the accuracy, reliability, development and effective use of computational models in making

scientific inferences. Mathematically rigorous UQ methodologies are essential to a wide range of DOE science and engineering applications in carrying out predictions, design optimization, decision making, or other high-level tasks. UQ relies on a broad range of applied mathematics and statistics research, along with algorithmic and computational developments, and subject matter expertise, to enable an appropriate level of confidence in the use of computational models for scientific investigations.

The computational science and engineering community understands the importance of uncertainty quantification, and key principles, best practices, and tools have been developed and are evolving for predictive science and engineering. At the same time, the nature of high-performance scientific computing research and practice is expected to be fundamentally different given the forecasts for disruptive changes in computing architectures and technologies in this decade. This FOA calls for basic research in methodologies and tools that will deliver significantly improved or advanced UQ capabilities for DOE-mission science based on anticipating the characteristics and challenges, and fully realizing the potential advantages, of using extreme-scale computing systems.

More specific information is included under SUPPLEMENTARY INFORMATION below.

A companion Program Announcement to DOE National Laboratories (LAB 13-895) will be posted on the SC Grants and Contracts web site at: <http://www.science.doe.gov/grants>

SUPPLEMENTARY INFORMATION

Extreme-scale science research recognizes that fundamentally different techniques, tools, and approaches will likely be needed to reap significant scientific benefits from disruptive, but potentially revolutionary, changes in technology [1,2]. Major advances in science are often closely intertwined with increases in technology capabilities, as typified by “Moore’s law” in computing performance. Scientific high-performance computing is a prime example in which needs and expectations for continued exponential scaling in performance are driving, and being influenced by, fundamental changes in underlying technologies such as processors, memory and interconnect systems, and the scientific computing software stack [3].

Over the past two decades, performance improvements were mainly achieved through a combination of: increasing processor speed; bulk-synchronous parallelism - where each programming element executes the same code with regular communication between processors; and advances in applied mathematics in such areas as mathematical modeling, adaptive algorithms and discretization techniques, and numerical analysis. Since 2004, processor speeds have plateaued at about 1-3 gigahertz due to physical limitations in today’s materials and fabrication technologies. Fortunately, aside from the performance of hardware component technology, innovations in computational modeling and algorithms for simulations have traditionally outpaced Moore’s law in getting more science done per second [4].

Numerous challenges arise in enabling applications to run effectively on next-generation, extreme-scale computing systems. Higher levels of computing performance will require that careful attention is given to the anticipated architectural features, such as:

- Extreme levels of concurrency. Improvements in performance will be achieved only through much higher levels of parallelism.
- Costly data storage and movement, and complex memory hierarchies. On a node, data movement will be much more costly, relative to other operations. Across nodes, networks will provide similar challenges and opportunities.
- Reduced memory sizes per core. The overall cost of memory technology is expected to limit the memory available.
- Resilience and non-deterministic behavior. A high number of hardware faults are expected due to the large number of computing system components.

Additionally, performance portability likely will be more challenging given the technology trends for highly heterogeneous architectures, deep memory hierarchies with reduced memory sizes per core, and other features [1,5,6,7].

UQ methodologies will play a key role in enabling the confident and effective use of extreme-scale computation as a major scientific tool for the DOE mission. In the context of this FOA, a “UQ methodology” is a generic term that covers a broad range of research topics which, when selectively taken together, form a foundation and significant integrated capability for enabling extreme-scale science. UQ methodology basic research topics includes, but is not limited to: verification and validation; representation of uncertainty and error; sensitivity and uncertainty analysis; multi-scale modeling and simulation; model uncertainty; multi-model ensembles; UQ for inverse problems and model calibration; decision-making and optimization under uncertainty; detection and forecasting of rare events; dealing with high-dimensional probability spaces; statistical modeling and sampling techniques; uncertainty reduction; and other related areas. Given that computational models provide only partial physical understanding, a proposed UQ methodology may also pursue effective strategies for incorporating results from theoretical analysis and/or the use of data from observational or experimental science activities [5,6,7,8,9,10].

The DOE “Scientific Grand Challenges Workshop Series” provides a well-documented set of reports on the grand challenges of specific DOE-mission science domains and the role of extreme-scale scientific computing in addressing those challenges [11,12]. Proposed extreme-scale UQ methodologies will vary across disciplines, along with relevant scientific quantities of interest (QOIs) and the intended use of the computational models. The approach to extreme-scale UQ will also be guided by relevant computational considerations, such as achieving the requisite accuracy and level of confidence in results at some combination of lowest energy and shortest execution time. Computational science is the so-called third pillar of scientific inquiry, beside theory and experimentation, and the rigorous development of extreme-scale UQ methodologies will be essential as an enabling technology for DOE-mission science on future architectures.

Applications submitted in response to this FOA must substantively address the following areas with regard to extreme-scale scientific computing:

1. Impact for DOE-mission science: What are the most significant or compelling scientific challenges that are driving the development of the proposed UQ methodology? If successfully developed, how will the advanced UQ capabilities be demonstrated?
2. Rigorous UQ methodology: Does the UQ methodology provide a new and/or significant integrated capability for enabling extreme-scale science? What are the potential merits and

limitations of the UQ methodology given the anticipated characteristics and challenges of using extreme-scale computing systems?

3. Advances in applied mathematics and/or statistics basic research: Does the proposed research develop a strong mathematical or statistical foundation for the UQ methodology?

The proposed research is expected to demonstrate the UQ methodology and level of capability through a combination of mathematical or statistical analysis, computational experiments, and a suite of relevant, nontrivial metrics as specified within the submitted FOA application [13].

References

[1] “Scientific Grand Challenges: Architectures and Technology for Extreme Scale Computing”, Report from the workshop held December 8-10, 2009.

http://science.energy.gov/~media/ascr/pdf/program-documents/docs/Arch_tech_grand_challenges_report.pdf

[2] “Report on the Workshop on Extreme-Scale Solvers: Transition to Future Architectures”, Report from the workshop held on March 8-9, 2012.

<http://science.energy.gov/~media/ascr/pdf/program-documents/docs/reportExtremeScaleSolvers2012.pdf>

[3] “Future Computing Performance: Game Over or Next Level?”,

http://www.nap.edu/openbook.php?record_id=12980

[4] “Taking on the ITER Challenge, Scientists Look to Innovative Algorithms, Petascale Computers”, SIAM News, Volume 39, Number 7, September 2006.

<http://www.siam.org/pdf/news/1005.pdf>

[5] “Science Based Nuclear Energy Systems Enabled by Advanced Modeling and Simulation at the Extreme Scale”, Report from the workshop held May 11-12, 2009.

http://science.energy.gov/~media/ascr/pdf/program-documents/docs/Sc_network_shop_report.pdf

[6] “Scientific Grand Challenges in National Security: The Role of Computing at the Extreme Scale”, Report from the workshop held October 6-8, 2009.

http://science.energy.gov/~media/ascr/pdf/program-documents/docs/Nnsa_grand_challenges_report.pdf

[7] “Scientific Grand Challenges: Crosscutting Technologies for Computing at the Exascale”, Report from the workshop held February 2-4, 2010.

http://science.energy.gov/~media/ascr/pdf/program-documents/docs/Crosscutting_grand_challenges.pdf

[8] “Assessing the Reliability of Complex Models - Mathematical and Statistical Foundations of Verification, Validation, and Uncertainty Quantification”, National Research Council 2012.

Washington, D.C.: The National Academies Press.

http://www.nap.edu/catalog.php?record_id=13395

[9] “A Multifaceted Mathematical Approach for Complex Systems”, Report of the DOE Workshop on Mathematics for the Analysis, Simulation, and Optimization of Complex Systems held on September 13-14, 2011.

http://science.energy.gov/~media/ascr/pdf/program-documents/docs/Multifaceted_Mathematical_Approach_for_Complex_Systems.pdf

[10] “Data and Communications in Basic Energy Sciences - Creating a Pathway for Scientific

Discovery”, Report from the workshop held on October 24-25, 2011.

http://science.energy.gov/~media/ascr/pdf/research/scidac/ASCR_BES_Data_Report.pdf

[11] “The Opportunity and Challenges of Exascale Computing”, Summary Report of the Advanced Scientific Computing Advisory Committee (ASCAC) Subcommittee, Fall 2010.

http://science.energy.gov/~media/ascr/ascac/pdf/reports/Exascale_subcommittee_report.pdf

[12] DOE Scientific Grand Challenges Workshop Series - <http://science.energy.gov/ascr/news-and-resources/workshops-and-conferences/grand-challenges/>

[13] “Evaluation of Quantification of Margins and Uncertainties Methodology for Assessing and Certifying the Reliability of the Nuclear Stockpile”,

http://www.nap.edu/catalog.php?record_id=12531

Collaboration

Collaborative research projects with other institutions such as universities, industry, non-profit organizations, and Federally Funded Research and Development Centers (FFRDCs), including the DOE National Laboratories are strongly encouraged but not required. Collaborative applications submitted from different institutions should clearly indicate they are part of a proposed collaboration. All collaborative applications must use the same title, abstract and technical narrative. In addition, such applications must describe the work and the associated budget for the research effort to be performed under the leadership of the principal investigator in each participating institution. The first page of collaborative applications should contain the project title followed by a tabular list of the researcher names, institutions, annual budget, and role as lead PI or co-PI of each participant. These collaborative applications should all have the same title as the lead institution. Each collaborating institution submitting an application must use the same title in Block 11 of the SF 424 (R&R) form.

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

Collaborative proposals from DOE National Laboratories should be submitted following the above rules in response to the companion announcement, LAB 13-895.

Section II – AWARD INFORMATION

A. TYPE OF AWARD INSTRUMENT

DOE anticipates awarding grants under this FOA.

B. ESTIMATED FUNDING

It is anticipated that up to \$5,000,000 per year will be available under this FOA and DOE National Laboratory Announcement LAB 13-895, contingent on satisfactory peer review and the availability of appropriated funds. Applicants should request project support for up to three years, with out-year support contingent on the availability of appropriated funds, progress of the research, and programmatic needs. Awards are expected to begin in Fiscal Year 2013, which ends on September 30, 2013.

DOE is under no obligation to pay for any costs associated with the preparation or submission of an application. 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

It is anticipated that approximately 4 to 9 projects will be funded, each with a total project budget ranging from \$150,000 to \$1,400,000 per year. Each institution that participates in a funded project receives a separate award. The minimum and maximum award size to an institution ranges from \$150,000 per year to \$1,400,000 per year.

D. EXPECTED NUMBER OF AWARDS

It is anticipated that approximately 4 to 9 projects will be funded, each with a total project budget ranging from \$150,000 to \$1,400,000 per year. Each institution that participates in a funded project receives a separate award. The number of awards to institutions is expected to range between 5 and 25 (approximately).

E. ANTICIPATED AWARD SIZE

It is anticipated that approximately 4 to 9 projects will be funded, each with a total project budget ranging from \$150,000 to \$1,400,000 per year. Each institution that participates in a funded project receives a separate award. The award size to an institution is anticipated to range between \$150,000 per year to \$1,400,000 per year.

F. PERIOD OF PERFORMANCE

Research Awards are expected to be made for a period of three years. Out-year funding will depend upon suitable progress and the availability of appropriated funds.

G. TYPE OF APPLICATION

DOE will accept only new applications under this FOA.

Section III – ELIGIBILITY INFORMATION

A. ELIGIBLE APPLICANTS

All types of applicants are eligible to apply, except Federally Funded Research and Development Center (FFRDC) Contractors, and nonprofit organizations described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995.

B. COST SHARING

Cost sharing is not required.

C. ELIGIBLE INDIVIDUALS

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

Section IV – APPLICATION AND SUBMISSION INFORMATION

A. ADDRESS TO REQUEST APPLICATION PACKAGE

Application forms and instructions are available at Grants.gov. To access these materials, go to <http://www.grants.gov>, select "Apply for Grants", and then select "Download Application Package." Enter the CFDA number (81.049) and/or the funding opportunity number (DE-FOA-0000895) shown on the cover of this FOA and then follow the prompts to download the application package.

Applications submitted through www.FedConnect.net will not be accepted.

B. LETTER OF INTENT AND PRE-APPLICATION

1. Letter of Intent

N/A

2. Pre-Application

Pre-Application Due Date: **April 24, 2013 at 5:00 PM Eastern Time**

A pre-application is required and must be submitted by **5:00 PM Eastern Time, April 24, 2013**. Only the Lead Institution must submit the pre-application. Failure to submit a pre-application will preclude the full application from consideration.

DOE will send a response by email to each applicant encouraging or discouraging the submission of a formal application by April 30, 2013. Applicants who have not received a response regarding the status of their pre-application by this date are responsible for contacting the program to confirm this status. **Only those applicants that receive notification from DOE encouraging a formal application may submit full applications.** No other formal applications will be considered.

Those pre-applications that are encouraged will be used to help the Office of Science begin planning for the formal application peer review process. The intent of the Office of Science in discouraging submission of certain full applications is to save the time and effort of applicants in preparing an application that is unlikely to be selected for award negotiations. Such assessments do not necessarily reflect judgments on the merits of the proposed project.

Pre-applications will be evaluated with respect to the scope and research directions as outlined in the SUMMARY and SUPPLEMENTARY INFORMATION sections. The pre-application 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-application should contain (1) a cover sheet, (2) a technical narrative, and (3) conflict of interest information. The cover sheet identifies the name, institutional affiliation, e-mail address and telephone number of the Lead Principal Investigator and Senior/Key personnel expected to be involved in the project, and an estimated amount of funding requested for each year and for each funded institution. No biographical data need be included.

The technical narrative must provide a clear, concise statement of specific research goals and objectives with respect to the development of UQ methodologies for enabling the confident and effective use of extreme-scale computation as a major scientific tool for the DOE mission.

To help the Office of Science avoid conflicts of interest (COI) in identifying potential reviewers, a list of collaborators, co-editors, and graduate/postdoctoral advisors and advisees must be submitted with the pre-application. **These lists should be the final set of pages in the pdf pre-application file and will not count against the two-page limit for the pre-application.** A COI list for the Lead Principal Investigator and each project collaborator (supported or unsupported) is required. Further guidance on how to prepare this COI list for each project member is included in the next two paragraphs.

Collaborators and Co-editors: List, in alphabetical order, all persons, including their current organizational affiliations, 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 May 2013. For publications or collaborations with more than 10 authors or participants, only list those individuals in the core group for which interactions occurred on a regular basis while the research was being done. Also, list any individuals who are currently or have been in the past co-editors on a special issue with you on a journal, compendium, or conference proceedings during the 24 months preceding May 2013. If there are no collaborators or co-editors to report, state “None.”

Graduate and Postdoctoral Advisors and Advisees: List the names of your graduate advisor(s) and principal postdoctoral sponsor(s) and their current organizational affiliations. Also, list the names of your graduate students and postdoctoral associates during the past five years.

It is important that the pre-application (called a preproposal in PAMS) be a single file with extension .pdf, .docx, or .doc. The preproposal 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 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.

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

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.

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. (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.
- 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 Preproposal:

- Create your preproposal 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 “Attach” 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 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 Funding Opportunity Announcement should reference **DE-FOA-0000895**.

C. CONTENT AND APPLICATION FORMS

You must complete the mandatory forms and any applicable optional forms (e.g., Disclosure of Lobbying Activities (SF-LLL)) in accordance with the instructions on the forms and the additional instructions below. Files that are attached to the forms must be in Adobe Portable Document Format (PDF) unless otherwise specified in this announcement.

LETTERS

Do not submit letters of support or endorsement as these are not used in making funding decisions and can interfere with the selection of peer reviewers.

1. SF-424 (R&R)

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

CERTIFICATIONS

By submitting an application in response to this FOA the Applicant certifies that:

- It is **not** a corporation that has been convicted (or had an officer or agent of such corporation acting on behalf of the corporation convicted) of a felony criminal violation under any Federal law within the preceding 24 months,
- It is **not** a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability,
- If the Applicant's financial assistance application is chosen for award and the award is in excess of \$1,000,000, the applicant will, by the end of the fiscal year, upgrade the efficiency of their facilities by replacing any lighting that does not meet or exceed the energy efficiency standard for incandescent light bulbs set forth in Section 325 of the Energy Policy and Conservation Act (42 USC 6295).

PUBLIC POLICY REQUIREMENTS

The applicant further certifies its compliance with the following public policy requirements:

- Animal Welfare as required by the Animal Welfare Act of 7 USC 2131 et seq. and regulated by 10 CFR 600 and 10 CFR 602
- "Blocking Property and Prohibiting Transactions with Persons Who Commit, Threaten to Commit, or Support Terrorism," EO 13224 of September 23, 2001, published at 66 FR 49079
- The Buy American Act of 1933, codified at 41 USC 10 et seq.
- The Cargo Preference Act, codified at 46 USC 55305 and regulated by 46 CFR 381.7
- Civil Rights Protections including but not limited to the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, the Rehabilitation Act of 1973, and the Age Discrimination Act of 1975, all of which are regulated by 10 CFR 1040 and 10 CFR 600
- "Creating a National Women's Business Enterprise Policy and Prescribing Arrangements for Developing, Coordinating and Implementing a National Program for Women's Business Enterprise," EO 12138 of May 18, 1979, published at 44 FR 29637
- Debarment and Suspension, as regulated at 10 CFR 600, 2 CFR 180 and 2 CFR 901

- The Drug-Free Workplace Act of 1988 (41 USC 701) as regulated by 10 CFR 607
- Environmental protection, including but not limited to
 - The Clean Air Act, codified at 42 USC 7401 et seq. and regulated by 10 CFR 600
 - The Clean Water Act, codified at 33 USC 1251 et seq. and regulated by 10 CFR 600
 - The National Environmental Policy Act of 1969, codified at 42 USC 4321 et seq. and regulated by 10 CFR 600
- The False Claims Acts (civil at 31 USC 3729 et seq. and criminal at 18 USC 287 and 18 USC 1001) regulated by 10 CFR 1013
- The Federal Funding Accountability and Transparency Act (Public Law 109-282) as regulated by 2 CFR 170
- The Fly America Act, codified at 49 USC 40118, which generally requires that travel supported by Federal funds be conducted on US-flag carriers
- The Hatch Act of 1939, codified at 5 USC 1501 et seq. and regulated by 10 CFR 600
- Health and Safety Regulations including but not limited to
 - OSHA's guidance at 29 CFR 1910
 - NRC safety regulations at 10 CFR 20
 - Sections of the Public Health Service Act, codified at 42 USC 300f
 - New Drug rules of 10 CFR 35.7
 - The Drug Abuse Office and Treatment Act, codified at 42 USC 290dd
 - Safe handling of etiological agents, as regulated at 49 CFR 171.1
 - Safe handling of recombinant DNA, as regulated at 10 CFR 600.3 and 10 CFR 602.10(b)
- Human Research Subjects Protection as regulated by 10 CFR 745 and 10 CFR 600
- The Lead-Based Paint Poisoning Prevention Act, codified at 42 USC 4831 and regulated by 10 CFR 600
- The Lobbying Disclosure Act of 1995, codified at 2 USC 1601 et seq.
- Lobbying Prohibitions of 31 USC 1352 and regulated by 10 CFR 601
- Metric System use as encouraged by EO 12770 of July 25, 1991
- Non-delinquency on Federal Debt as required by the Federal Debt Collection Procedures Act of 1990, codified at 28 USC 3201
- The Paperwork Reduction Act, codified at 44 USC 3501 et seq. and regulated by 10 CFR 600
- Prohibition on benefiting Members of Congress as required by 41 USC 6306
- Protection of Significant pre-historical, historical, or archeological data as required by the National Historic Preservation Act of 1966, codified at 16 USC 470f, the Archeological and Historic Preservation Act of 1966, codified at 16 USC 469 et seq., EO 11593, published at 36 FR 8921 (May 13, 1971), and Protection of Historic and Cultural Properties, 36 CFR 800, all of which are regulated by 10 CFR 600
- Seat Belt Use, as required by EO 13043 of April 16, 1997
- Select agent registration as regulated by 7 CFR 331, 9 CFR 121 and 42 CFR 73
- Text Messaging While Driving, as required by EO 13513 of October 1, 2009, published at 74 FR 51225
- Trafficking in Persons, as required by the Trafficking Victims Protection Act of 2000 (codified at 22 USC 7104) and regulated by 2 CFR 175

2. Research and Related Other Project Information

Complete questions 1 through 6 and attach files. The files must comply with the following instructions:

PROJECT SUMMARY/ABSTRACT (FIELD 7 ON THE FORM)

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 project director/principal investigator(s) (PD/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), and major participants (for collaborative projects). 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. To attach a Project Summary/Abstract, click "Add Attachment."

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

DOE COVER PAGE

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

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:
- Funding Opportunity FOA Number: **DE-FOA-0000895**
- DOE/Office of Science Program Office: **Office of Advanced Scientific Computing Research**
- DOE/Office of Science Program Office Technical Contact: **Dr. Steven L. Lee**
- Research area or areas (as identified in Part I) :

COVER PAGE SUPPLEMENT FOR COLLABORATIONS

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

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.

- 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.

Name of Collaborative Project						
	Name	Institution	Year 1 Budget	Year 2 Budget	Year 3 Budget	Total Budget
	Lead PI		\$	\$	\$	\$
	Co-PI		\$	\$	\$	\$
	Co-PI		\$	\$	\$	\$
	TOTALS		\$	\$	\$	\$

Example budget table (\$ in thousands)

* Note that collaborating applications must be submitted separately.

PROJECT NARRATIVE (FIELD 8 ON THE FORM)

The project narrative **must not exceed 15 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. Applications exceeding the page limit will be rejected without review.

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 publications 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.”

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 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.

It is important that the 15-page project narrative section provide a complete description of the proposed work, because reviewers are not obliged to read the Appendices. Applications exceeding these page limits may be rejected without review or the first 15 pages may be reviewed without regard to the remainder. The page count of 15 does not include the Cover Page and Budget Pages, the Title Page, the biographical material and publication information, or any Appendices.

APPENDIX 1: BIOGRAPHICAL SKETCH(ES)

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) during the last 5 years. Also, list the names and current organizational affiliations of your graduate students and postdoctoral associates during the past 5 years.

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. 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 senior/key person. Provide the Current and Pending Support as an appendix to your project narrative. Concurrent submission of an application 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. You may also use this convention in the application bibliography. Include only bibliographic citations. Applicants should be especially careful to follow scholarly practices in providing citations for source materials relied upon when preparing any section of the application. Provide the Bibliography and References Cited information as an appendix to your project narrative.

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

APPENDIX 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: OTHER ATTACHMENT

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

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.
- **Do not attach any of the requested appendices described above as files for fields 9, 10, 11, and 12.**
- **Follow the above instructions to include the information as appendices to the project narrative file.**
- **These appendices will not count toward the project narrative’s page limitation.**

3. Research and Related Budget

Complete the Research and Related Budget form in accordance with the instructions on the form (Activate Help Mode to see instructions) and the following instructions. You must complete a separate budget for each year of support requested. The form will generate a cumulative budget for the total project period. You must complete all the mandatory information on the form before the NEXT PERIOD button is activated. You may request funds under any of the categories listed

as long as the item and amount are necessary to perform the proposed work, meet all the criteria for allowability under the applicable Federal cost principles, and are not prohibited by the funding restrictions in this FOA (See PART IV, G).

Budgets must conform to the maximum permissible request identified in Section II.

BUDGET JUSTIFICATION (FIELD K ON THE FORM)

Provide the required supporting information for the following costs (See R&R Budget instructions): equipment; domestic and foreign travel; participant/trainees; materials and supplies; publication; consultant services; ADP/computer services; subaward/consortium/contractual; equipment or facility rental/user fees; alterations and renovations; and indirect cost type. Provide any other information you wish to submit to justify your budget request. **Attach a single budget justification file for the entire project period in field K.** The file automatically carries over to each budget year.

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

Budgets for Subawardees, other than DOE FFRDC Contractors: You must provide a separate cumulative R&R budget for each subawardee that is expected to perform work estimated to be more than \$100,000 or 50 percent of the total work effort (whichever is less). If you are selected for award, you must submit a multi-year budget for each of these subawardees (See Section IV.D for submission of Subawardees' multi-year budgets). Download the R&R Budget Attachment from the R&R SUBAWARD BUDGET ATTACHMENT(S) FORM and e-mail it to each subawardee that is required to submit a separate budget. After the subawardee has e-mailed its completed budget back to you, attach it to one of the blocks provided on the form. Use up to 10 letters of the subawardee's name (plus.xfd) as the file name (e.g., ucla.xfd or energyres.xfd).

5. Project/Performance Site Location(s)

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

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

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

6. Summary of Required Forms/Files

Your application must include the following items:

Name of Document	Format	Attach to
SF 424 (R&R)	Form	N/A
RESEARCH AND RELATED Other Project Information	Form	N/A
Project Summary/Abstract	PDF	Field 7
Project Narrative, including required appendices	PDF	Field 8
RESEARCH & RELATED BUDGET	Form	N/A
Budget Justification	PDF	Field K
PROJECT/PERFORMANCE SITE LOCATION(S)	Form	N/A
SF-LLL Disclosure of Lobbying Activities, if applicable	Form	N/A

D. SUBMISSIONS FROM SUCCESSFUL APPLICANTS

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

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

E. SUBMISSION DATES AND TIMES

1. Letter of Intent Due Date

N/A

2. Pre-application Due Date

April 24, 2013 at 5:00 PM Eastern Time

3. Application Due Date

May 24, 2013 at 5:00 PM Eastern Time

You are encouraged to transmit your application well before the deadline. Applications received after the deadline will not be reviewed or considered for award.

4. Late Submissions

Late submissions will not be accepted under this FOA. However, delays in submitting letters of intent, pre-applications, and applications may be unavoidable. DOE has accepted late submissions when applicants have been unable to make timely submissions because of

technological disruptions or significant natural disasters. Other circumstances do 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.

F. INTERGOVERNMENTAL REVIEW

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

G. FUNDING RESTRICTIONS

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

Cost Principles: Costs must be allowable, allocable and reasonable in accordance with the applicable Federal cost principles referenced in 10 CFR 600. The cost principles for commercial organization are in FAR Part 31.

Pre-award Costs: Recipients may charge to an award resulting from this announcement pre-award costs that were incurred within the ninety (90) calendar day period immediately preceding the effective date of the award, if the costs are allowable in accordance with the applicable Federal cost principles referenced in 10 CFR 600 and 2 CFR 215. Recipients must obtain the prior approval of the contracting officer for any pre-award costs that are for periods greater than this 90 day calendar period.

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

H. OTHER SUBMISSION AND REGISTRATION REQUIREMENTS

1. Where to Submit

Applications must be submitted through [grants.gov](https://www.grants.gov) to be considered for award.

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

2. Registration Process

ONE-TIME REGISTRATION PROCESS

You must complete the one-time registration process (all steps) before you can submit your first application through Grants.gov (See http://www.grants.gov/applicants/get_registered.jsp). We recommend that you start this process at least six weeks before the application due date. It may take 44 days or more to complete the entire process. Use the Grants.gov Organizational Registration Checklists at <http://www.grants.gov/assets/OrganizationRegCheck.pdf> to guide you through the process. During the SAM registration process, you will be asked to designate an E-Business Point of Contact (EBIZ POC). The EBIZ POC must obtain a special password called "Marketing Partner Identification Number" (MPIN). When you have completed the process, you should call the Grants.gov Helpdesk at 1-800-518-4726 to verify that you have completed the final step (i.e., Grants.gov registration).

3. Application Receipt Notices

After an application is submitted, the Authorized Organization Representative (AOR) will receive a series of four e-mails. It is extremely important that the AOR watch for and save each of the emails. It may take up to two (2) business days from application submission to receipt of email Number 2. The titles of the four e-mails are:

- Number 1 - Grants.gov Submission Receipt Number
- Number 2 - Grants.gov Submission Validation Receipt for Application Number
- Number 3 - Grants.gov Grantor Agency Retrieval Receipt for Application Number
- Number 4 - Grants.gov Agency Tracking Number Assignment for Application Number

4. Viewing Submitted Applications

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

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

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

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

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

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

1. To register, click the “Create New PAMS Account” link on the website <https://pamspublic.science.energy.gov/>.
2. Click the “No, I have never had an account” link and then the “Create Account” button.
3. You will be prompted to enter your name and email address, create a username and password, and select a security question and answer. Once you have done this, click the “Save and Continue” button.
4. On the next page, enter the required information (at least one phone number and your mailing address) and any optional information you wish to provide (e.g., FAX number, website, mailstop code, additional email addresses or phone numbers, Division/Department). Click the “Create Account” button.
5. Read the user agreement and click the “Accept” button to indicate that you understand your responsibilities and agree to comply with the rules of behavior for PAMS.
6. You will be taken to the Register to Institution page. Select the link labeled, “Option 1: My institution has submitted a proposal in Grants.gov. I am here to register as an SRO, PI, or POC (Sponsored Research Officer, Principal Investigator, or Point of Contact).”
7. Enter the following information:
 - Proposal ID: Enter the ten-digit PAMS proposal ID, including the leading zeros (e.g., 00002xxxxx). Do not use the Grants.gov proposal number. Use the PAMS number previously sent to you in the email with subject line, “Receipt of Proposal ...”.
 - Email (as entered in Grants.gov proposal): Enter your email address as it appears on the SF424(R&R) Cover Page.
 - Choose Role: Select the radio button in front of the role corresponding to the SF-424 (R&R) cover page. If your name appears in block 19 of the SF-424 (R&R) cover page as the authorizing representative, select “SRO/BO/AO (Sponsored Research Officer/Business Officer/Administrative Officer).” If your name appears in block 14 of

- the SF424 R&R cover page as the PI, select “Principal Investigator (PI).” If your name appears in block 5 of the SF424 R&R as the point of contact, select “Other (POC).”
8. Click the “Save and Continue” button. You will be taken to your “My Proposals” page. The Grants.gov proposal will now appear in your list of proposals. Click the “Actions/Views” link in the options column next to this proposal to obtain a dropdown list. Select “Proposal” from the dropdown to see the proposal.

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

The steps above will work only for proposals submitted to the DOE Office of Science since May 2012.

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 Funding Opportunity Announcement should reference **DE-FOA-0000895**.

Section V - APPLICATION REVIEW INFORMATION

A. CRITERIA

1. Initial Review Criteria

Prior to a comprehensive merit evaluation, DOE will perform an initial review in accordance with 10 CFR 605.10(b) to determine that (1) the applicant is eligible for the award; (2) the information required by the FOA has been submitted; (3) all mandatory requirements are satisfied; (4) the proposed project is responsive to the objectives of the funding opportunity announcement, and (5) the proposed project is not duplicative of programmatic work.

Applications that fail to pass the initial review will not be forwarded for merit review and will be eliminated from further consideration.

2. Merit Review Criteria

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

- Scientific and/or Technical Merit of the Project;
- Appropriateness of the Proposed Method or Approach;
- Competency of Applicant's Personnel and Adequacy of Proposed Resources; and
- Reasonableness and Appropriateness of the Proposed Budget.

The evaluation process will include program policy factors such as the relevance of the proposed research to the terms of the FOA 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 will be provided to the merit reviewers to elaborate the criteria established by regulation:

SCIENTIFIC AND/OR TECHNICAL MERIT OF THE PROPOSED RESEARCH

- To what extent does the application articulate significant or compelling scientific challenges that are driving the development of the proposed UQ methodology? To what extent does the application clearly describe a plan for demonstrating the successful development of the advanced UQ capabilities? To what extent does the proposed research develop a strong mathematical or statistical foundation for the UQ methodology?

APPROPRIATENESS OF THE PROPOSED METHOD OR APPROACH

- To what extent does the UQ methodology provide a new and/or significant integrated capability for enabling extreme-scale science? What are the potential merits and limitations of the UQ methodology given the anticipated characteristics and challenges of using extreme-scale computing systems? To what extent does the application identify significant potential problems and consider alternative strategies? How will intermediate results be generated and how will progress be measured?

COMPETENCY OF APPLICANT'S PERSONNEL AND ADEQUACY OF PROPOSED RESOURCES

- To what extent does the project team have the requisite background and level of expertise to accomplish the proposed research? To what extent are the technical responsibilities of senior or key personnel clearly and adequately described? How well organized is the timeline for major research goals and objectives?

REASONABLENESS AND APPROPRIATENESS OF THE PROPOSED BUDGET

- To what extent are the personnel staffing levels adequate to carry out the proposed research? To what extent is the travel budget appropriate and reasonable?

B. REVIEW AND SELECTION PROCESS

1. Merit Review

Applications 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://www.sc.doe.gov/grants/merit.asp>.

2. Selection

The Selection Officials will consider merit review recommendations as well as program policy factors, such as ensuring a programmatically appropriate balance within the program areas, and quality of previous performance. Selection of applications for award will be based upon the findings of the technical evaluations, the importance and relevance of the proposed research to the SC mission, and funding availability.

3. Discussions and Award

The Government may enter into discussions with a selected applicant for any reason deemed necessary, including but not limited to: (1) the budget is not appropriate or reasonable for the requirement; (2) only a portion of the application is selected for award; (3) the Government needs additional information to determine that the recipient is capable of complying with the

requirements in 10 CFR 600 and 10 CFR 605; and/or (4) special terms and conditions are required. Failure to resolve satisfactorily the issues identified by the Government will preclude award to the applicant.

C. ANTICIPATED NOTICE OF SELECTION AND AWARD DATES

It is anticipated that the award selection will be completed by June 30, 2013. It is expected that awards will be made in Fiscal Year 2013.

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. (See Part IV.G with respect to the allowability of pre-award costs.)

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

2. Notice of Award

An Assistance Agreement issued by the contracting officer is the authorizing award document. It normally includes either as an attachment or by reference: (1) Special Terms and Conditions; (2) Applicable program regulations, if any; (3) Application as approved by DOE; (4) DOE assistance regulations at 10 CFR 600, or, for Federal Demonstration Partnership (FDP) institutions, the FDP terms and conditions; (5) National Policy Assurances To Be Incorporated As Award Terms; (6) Budget Summary; and (7) Federal Assistance Reporting Checklist, which identifies the reporting requirements.

B. ADMINISTRATIVE AND NATIONAL POLICY REQUIREMENTS

1. Administrative Requirements

The administrative requirements for DOE grants and cooperative agreements are contained in 10 CFR 600 and 10 CFR 605. Grants and cooperative agreements made to universities, non-profits and other entities subject to 2 CFR 215 are subject to the Research Terms and Conditions located on the National Science Foundation web site at <http://www.nsf.gov/bfa/dias/policy/rtc/index.jsp>.

DUNS AND SAM REQUIREMENTS

Additional administrative requirements for DOE grants and cooperative agreements are contained in 2 CFR 25 (See: <http://www.ecfr.gov>). Prime awardees must keep their data at the System for Award Management (SAM) current at <http://www.sam.gov>. SAM is the government-wide system that replaced the Central Contractor Registry (CCR). If you had an active registration in the CCR, you have an active registration in SAM. Subawardees at all tiers must obtain DUNS numbers and provide the DUNS to the prime awardee before the subaward can be issued.

SUBAWARD AND EXECUTIVE REPORTING

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

PROHIBITION ON LOBBYING ACTIVITY

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

2. Terms and Conditions

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

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

3. National Policy Assurances

The National Policy Assurances To Be Incorporated As Award Terms are located at <http://www.nsf.gov/bfa/dias/policy/rtc/appc.pdf> and at <http://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms> under Award Terms.

4. Statement of Substantial Involvement

Cooperative agreements may be awarded under this FOA. The DOE Contract Specialist and DOE Program Manager will negotiate a Statement of Substantial Involvement prior to award.

C. REPORTING

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

Section VII - QUESTIONS/AGENCY CONTACTS

A. QUESTIONS

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

Please only contact the grants.gov help desk for questions related to grants.gov.

For help with PAMS, click the “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 Funding Opportunity Announcement should reference **DE-FOA-000895**.

Please contact the PAMS help desk for technological issues with the PAMS system.

Questions regarding the specific program areas and technical requirements may be directed to the technical contacts listed for each program within the FOA or below.

Please contact the program staff with all questions not directly related to the grants.gov or PAMS systems.

B. AGENCY CONTACTS

Grants.gov Customer Support	800-518-4726 (toll-free) support@grants.gov
PAMS Customer Support	855-818-1846 (toll-free) 301-903-9610 sc.pams-helpdesk@science.doe.gov
Program Manager Scientific Contact	Steven L. Lee Phone: 301-903-5710 Email: steven.lee@science.doe.gov

Section VIII - OTHER INFORMATION

A. MODIFICATIONS

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

B. GOVERNMENT RIGHT TO REJECT OR NEGOTIATE

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

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 APPLICATION INFORMATION

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

“The data contained in pages _____ of this application have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes, provided that if this applicant receives an award as a result of or in connection with the submission of this application, DOE shall have the right to use or disclose the data herein to the extent provided in the award. This restriction does not limit the government’s right to use or disclose data obtained without restriction from any source, including the applicant.”

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

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

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

F. INTELLECTUAL PROPERTY DEVELOPED UNDER THIS PROGRAM

Patent Rights: The government will have certain statutory rights in an invention that is conceived or first actually reduced to practice under a DOE award. 42 USC 5908 provides that title to such inventions vests in the United States, except where 35 USC 202 provides otherwise for nonprofit organizations or small business firms. However, the Secretary of Energy may waive all or any part of the rights of the United States subject to certain conditions. (See “Notice of Right to Request Patent Waiver” in paragraph G below.)

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

G. NOTICE OF RIGHT TO REQUEST PATENT WAIVER

Applicants may request a waiver of all or any part of the rights of the United States in inventions conceived or first actually reduced to practice in performance of an agreement as a result of this FOA, in advance of or within 30 days after the effective date of the award. Even if such advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver of the rights of the United States in identified inventions, i.e., individual inventions conceived or first actually reduced to practice in performance of the award. Any patent waiver that may be granted is subject to certain terms and conditions in 10 CFR 784, <http://www.gc.doe.gov/documents/patwaivclau.pdf>.

Domestic small businesses and domestic nonprofit organizations will receive the patent rights clause at 37 CFR 401.14, i.e., the implementation of the Bayh-Dole Act. This clause permits domestic small business and domestic nonprofit organizations to retain title to subject inventions. Therefore, small businesses and nonprofit organizations do not need to request a waiver.

H. NOTICE REGARDING ELIGIBLE/INELIGIBLE ACTIVITIES

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

I. 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.