FINANCIAL ASSISTANCE
FUNDING OPPORTUNITY ANNOUNCEMENT

U.S. Department of Energy

Office of Science

Office of Advanced Scientific Computing Research (ASCR)

2012 X-Stack: Programming Challenges, Runtime Systems, and Tools

Funding Opportunity Number: DE-FOA-0000619

Announcement Type: AMENDMENT II

CFDA Number: 81.049

Amendment Issued:	**12/20/2011**
ISSUE DATE:	**November 22, 2011**
Letter of Intent Due Date: **(Strongly Encouraged)**	**December 21, 2011**
Application Due Date:	**February 6, 2012, 11:59 p.m. Eastern Time**

This Funding Opportunity Announcement (FOA) has been amended to change the Letter of Intent Due Date from December 19, 2011 to December 21, 2011.

NOTE: REQUIREMENTS FOR GRANTS.GOV

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 Central Contract Registry (CCR) 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.

Registration Requirements: There are several one-time actions you must complete in order to submit an application through Grants.gov (i.e., obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number, register with the CCR, register with the credential provider, and register with Grants.gov). To register with Grants.gov go to "Get Registered" at http://grants.gov/applicants/get_registered.jsp. Use the Grants.gov Organization Registration Checklist at http://www.grants.gov/assets/OrganizationRegCheck.pdf to guide you through the process. Designating an E-Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in the CCR registration process. Applicants, who are not registered with CCR and Grants.gov, should allow at least 21 days to complete these requirements. It is suggested that the process be started as soon as possible.

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).

Questions: Questions relating to the 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. Part VII of this Funding Opportunity Announcement (FOA) explains how to submit other questions to the Department of Energy (DOE).

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

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PART I – FUNDING OPPORTUNITY DESCRIPTION

GENERAL INQUIRIES ABOUT THIS FOA SHOULD BE DIRECTED TO:

Technical/Scientific Program Contacts:

Program Manager: Dr. Sonia R. Sachs, (301) 903-0060
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Program Manager: Dr. Lenore Mullin, (301) 903-7113
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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 Part 600
U.S. Department of Energy, Office of Science Financial Assistance Program Rule, codified at 10 CFR Part 605

SUMMARY:

The Office of Advanced Scientific Computing Research (ASCR) of the Office of Science (SC), U.S. Department of Energy (DOE), hereby invites applications for basic research that represents significant advances in programming models, languages, compilers, runtime systems and tools that address fundamental challenges related to the system software stack for Exascale computing platforms (X-Stack).

Programming models, languages, and related technologies that have sustained High Performance Computing (HPC) application software development for the past decade are inadequate for Exascale era computers. The significant increase in complexity of Exascale platforms due to energy-constrained, billion-way parallelism, with major changes to processor and memory architecture, requires new energy-efficient and resilient programming techniques that are portable across multiple future machine generations. We expect to make research investments that address fundamental Exascale challenges, while offering a transition path for existing scientific applications to fully explore the challenges and rewards of Exascale platforms. Exascale programming challenges and strategies were identified in the ASCR Exascale Programming Challenges Workshop [1] and carefully captured in the workshop report [2]. Challenges and strategies related to tools for Exascale platforms were identified in the ASCR Exascale Tools Workshop [3], and captured in the workshop report [4].

Sought are complete solutions that will address multiple components of the system software stack and that will have the following characteristics:

- Scalability: enable applications to strongly scale to Exascale levels of parallelism;
- Programmability: clearly reduce the burden we are placing on high performance programmers;
- Performance Portability: eliminate or significantly minimize requirements for porting to future platforms;
- Resilience: properly manage fault detection and recovery at all components of the software stack; and
- Energy Efficiency: maximally exploit dynamic energy saving opportunities, leveraging the tradeoffs between energy efficiency, resilience, and performance.

We encourage solutions that involve radically new approaches to programming Exascale applications and algorithms. New approaches are required in order to address the complexities of Exascale systems. It is important to demonstrate the viability of such solutions in a broad high performance programming context by showing how the proposed solution:

- interoperates with existing programming environments based on the MPI+X model, so that a smooth migration path is enabled, and/or
- enables the automatic transformation of applications (possibly with users in the loop) from the "old" programming environment to the "new" one, such that the transformations are semantics and performance preserving.

More specific information is included under SUPPLEMENTARY INFORMATION below.

A companion Program Announcement to DOE National Laboratories, LAB 12-619, will be posted on the SC Grants and Contracts web site at: http://www.science.doe.gov/grants

SUPPLEMENTARY INFORMATION:

With the growth in clock frequency stalled, performance advances are now being achieved by an exponential growth in the number of processing elements per chip and growing hardware threading per core. The number of "cores" or explicitly parallel computational elements per chip is likely to double every 18-24 months henceforth. Power has rapidly become the leading design constraint for future HPC systems. New approaches will not emerge from evolutionary changes in processor speed and scale from today's Petascale systems, but will require fundamental breakthroughs in hardware technology, programming models, algorithms, and software at both the system and application level.

As complex memory systems, including 3D memories, are essential components of Exascale architectures, a number of questions are raised as a new memory model is created. This essential component of Exascale platforms will impact the design of lightweight mechanisms for memory management, memory virtualization, and for data placement, caching and migration, all of which impact the system software stack.

Exascale systems are expected to have approximately 3-5 orders of magnitude more concurrency than current Petascale platforms. Such systems present both opportunities and challenges to

scientific applications and the software stack that supports their ability to express and manage up to a billion separate threads. New algorithms will be required that can exploit vastly more parallelism than existing algorithms without requiring the same order of magnitude more memory, because the available memory will not scale by the same factor. Expressing these new algorithms will require new programming models and programming language constructs that are not available in existing languages.

Energy constraints and resilience challenges add complexity dimensions to programming Exascale systems, so that understanding and leveraging the tradeoffs between energy efficiency, resilience, and performance will be paramount for Exascale systems. Given that minimizing data movement will be critical for energy-constrained architectures, new parallel algorithms with improved locality of reference are required. In addition, active energy and power management may require remapping software dynamically to adjust to changing resource availability, with fine-grained controls in order to maximally exploit dynamic energy saving opportunities. Exascale systems are expected to have a low Mean Time to Interrupt (MTTI) and to suffer from undetected soft hardware errors, leading to a high failure rate of hardware components. These concerns−added to increased component counts, increased software complexity, and numerical accuracy at Exascale−will require radically new approaches to resilience that will involve fault detection and recovery at all components of the software stack.

The complexity of Exascale systems in terms of architectural attributes of concurrency, locality, hierarchy, and heterogeneity is significantly increased from previous machine generations, inhibiting the ability to program such systems. Significant advances in programming models, programming languages, compilers, runtime systems and tools will be needed in order to maximize concurrency, properly deal with asynchrony of computation and communication, exploit data locality, deal with deep memory hierarchies, minimize data movement, hide latencies, manage faults, deal with heterogeneous computing elements, and yet be easily programmable by application developers. Application developers recognize the major disruptions expected in Exascale systems, and are aware that they will need to rewrite their applications. However, application developers need to be assured that the return on their effort can be leveraged for future generations of HPC platforms.

Specific Supplementary Information on Exascale Programming Models and Languages:
Developing high-performance code for an application will involve multiple levels of representations, with semantic and performance preserving transformations that map high-level specifications of a problem into lower level ones, with the lowest level being an executable that is compile and runtime optimized to a particular platform. Semantic and performance preserving transformations enable optimizations to be accomplished without knowledge of how lower layers are implemented, which is fundamental for performance portability.

Each component of this programming stack is associated, at least implicitly, with an abstract machine and a programming model. An abstract machine exposes some but not all features of the platform, and the programming model permits the specification and optimization of how those features are used by the program without having to deal with the complexity of the full machine. Abstract machine models were discussed at the DOE ASCR 2011 Workshops on Architecture I [5], Architecture II [6] and conclusions regarding these models for Exascale platforms are

presented at the workshop report [7].

Different kinds of programmers will be involved in developing Exascale applications. Programmers with expertise in the science domain need a more declarative programming style that emphasizes the semantics of the domain, whereas programmers with hardware/software stack expertise can use an imperative programming model that provides full control over mappings to hardware architecture. Functional semantics, which can be incrementally inserted into a language rather than limited to new functional programming languages, will have an important role in novel programming environments.

We expect that high level specifications will use domain specific languages (DSLs) or embedded DSLs to capture the mathematics needed by domain scientists, enabling them to focus on their science rather than the fine details of a complex Exascale system. Automation will be used in the programming stack transformations, significantly reducing the burden placed on high performance programmers, and providing consistency in results, performance, and range of possibilities explored. We also expect that at each component of the programming stack, "reverse mappings" capture execution information of a lower layer component, mapping it to the constructs of a programming model of a higher layer component.

Solutions in Programming Models and Languages may include, but are not limited to, novel strategies in the areas of:

- DSLs and Embedded DSLs that enable domain properties to be used in the optimization of programs at the highest abstraction levels;
- New programming abstractions that virtualize the notion of a core and threading Application Programming Interfaces (APIs) with expanded semantics for thread control, placement, launching, and synchronization; New programming abstractions and mechanisms to express memory locality such that data movement through the memory hierarchy is addressed and portability across platforms with different memory hierarchies is guaranteed;
- Novel declarative paradigms to deal with asynchronous computations and fine-grained nested parallelism, while enabling the joint optimization among techniques for algorithm exploration, representation exploration, parallelization, placement, and scheduling; and
- Automated techniques that transform domain-specific abstract representations of computations into multiple intermediate abstract representations on the path to a runtime optimized code, as elaborated in section 4.1 of [2].

Specific Supplementary Information on Exascale Compilers and Runtime Systems:
A paradigm shift is required to achieve Exascale computing, as following conventional practice may undermine our goal of high performance, low power Exascale computations. This shift is represented by the execution model [8], which is responsible for orchestrating all aspects of executions on a particular machine. The execution model for a computer determines the design of associated abstract machine models, compilers, and runtime systems. Current research investment on this area is ongoing [9], [10], and is expected to inform future investments in compiler and runtime technologies, including awards that result from this FOA.

Compilers will be the natural place to implement optimizations that explore options for discretization, data representation, scheduling, placement, and choice of solvers. Coupled with hierarchical processing and memory structures, compiler management of parallelism, data locality and data movement across the system will become even more important to performance and also essential to managing power and energy. Driven by the complexity of compiler mapping and optimization technology, interfaces among compiler, programming model and run-time system will need to be redesigned.

The biggest disruption in the path to Exascale will occur at the intra-node level, due to severe memory and power constraints per core, 3X increase in the degree of intra-node parallelism, and to the vast degrees of performance and functional heterogeneity across cores. These challenges clearly point to radically new approaches to intra-node runtime systems. Functions expected from novel, self-aware, resilient runtime systems are the autonomic management of resources, dynamic load balancing, latency hiding mechanisms, management of data movement and locality, active power management, and detection and recovery from faults.

Advanced runtime systems that support new programming models and languages are needed. New runtime approaches can be used to rethink automatic parallelization of applications, with results that have not been possible up to date with compile-time approaches. Novel runtime mechanisms include fast synchronization of operations, as well as lightweight and adaptive communication configuration and management that enable the efficient mapping of the communication graph onto the underlying hardware interconnection topology. Schedulers must dynamically maximize resource utilization and minimize work starvation and resource contention, all while avoiding deadlocks and dealing with powered off resources and hardware features. Efficient locality-sensitive scheduling of the billion-way tasks, including task placement and migration, is a major research challenge to be addressed. Fault handling through transparent task migration and system reconfiguration adds yet another layer of complexity to this challenge. Simulation modeling will certainly be helpful for innovative designs in this area.

Solutions in Compilers and Runtime Systems may include, but are not limited to, novel strategies in the areas of:

- Compiler and runtime methods to support fine-grained dynamic parallelism, data locality, heterogeneity, resiliency, and energy efficiency across the system, exploring and optimizing options for discretization, data representation, scheduling, placement and integrating parallelism within and between nodes; Novel compiler and run-time interfaces that are conducive to dynamic behavior and empirical search-based optimization techniques. Compiler support that automates transformations of code from their semantic description to their implementation on a specific architecture;
- Compiler support for embedded DSLs and for transformations of code from their high level semantic description to their implementation on a specific architecture; Novel runtime approaches to enable auto-parallelization of applications; and
- Self-aware runtime systems and lightweight OS kernels for the support of efficient and dynamic communications, synchronization, scheduling, task placement and migration, as well as the autonomic management of resources, identifying and reacting to load imbalances and the intermittent loss of resources.

Specific Supplementary Information on Exascale Tools:
Harnessing the potential of Exascale platforms is a daunting task because of the unprecedented complexity of these systems. Applications, software stack, and tools face similar challenges at Exascale and will need to concurrently evolve.

Advanced tools should be co-designed with programming models, runtime systems, operating systems, and hardware architectures, so that tool interfaces and requirements are integrated into the stack components. These tools need to support the multiple levels of abstractions that will be required in Exascale applications, from domain-specific, to intermediate representations, to low-level abstractions, focusing on several different audiences and providing the necessary information for high-level users, who rely only on the provided abstractions, and system users, who have a solid understanding of the system complexities and are willing to break abstractions where necessary to achieve performance.

Exascale programmers will need a new generation of performance tools that help users assess how efficiently the billion-way concurrency is being employed, how well applications are dynamically adapting to faults and varying hardware performance, how well applications are taking advantage of the available memory hierarchy, how much unnecessary data replication is present, what data movement and energy efficiency opportunities are left unexplored, how efficient are resources allocated, what is the impact of contention for shared resources−all of which is correlated to the application source code and provides insights and automated methods to prevent or mitigate performance problems.

Advanced performance tools will need to leverage hardware monitoring capabilities to identify inefficient access patterns, quantify the costs of these inefficiencies, and provide guidance as to how the code can be improved. These tools should be able to monitor health and status of system resources, including fault detection, mapping captured information into the software stack, which in turn is used in the optimization of application codes while they run (e.g., process migration may be triggered by the identification of load imbalance by the performance analysis tool).

In order to deal with the Exascale levels of concurrency, tools will have to manage a flood of data and, as a consequence, comprehensive execution tracing to a central storage location for post mortem analysis will be infeasible for the full system. To measure long-running executions in their entirety, only tools that record compact execution profiles will be practical.

Exascale also demands a new generation of debugging tools that automatically or semi-automatically reduce the problem to smaller core counts. Tool support for debugging at Exascale should range from simple approaches that cluster processes into similar groups, to automatic root cause analysis that directly points users to the most probable causes for observed behaviors. Debugging solutions should be capable of combining static information extracted from an application's source or binary code with dynamically gathered and aggregated data.

Debugging and correctness tools are expected to operate at the full scale of the Exascale platform, deal with heterogeneous hardware, specialized memory systems, and with hardware, system software and applications that are highly adaptive to changing system conditions.

Debugging at a large scale should include problem reduction methods (e.g., group operations), automatic analysis techniques (e.g., outlier detection, various forms of clustering, automatic model generation), and root cause detection techniques. The need to virtualize new hardware support for managing and accessing memory efficiently will likely require automated transformations, which in turn require mechanisms to verify the correctness of such transformations in order to guarantee an equivalent execution. Debugging tools should offer interfaces that expose hardware features and how code is executed on the underlying hardware and associated software stack. Introspection capabilities (such as memory reference tracing, external environment control, etc.) will be key to the effectiveness of tools and interacting components.

Beyond performance analysis and debugging tools, a new category of tools will be needed in Exascale systems such that developing code "correct by design" is enforced. Tools for correctness include techniques for preventing problems in the code as part of its development, guiding the development of correct code and validating numerous properties via proof techniques. Model checking tools, narrowed to address high performance computing requirements, can be extremely useful to support application development because they not only detect problems in a very comprehensive way (100% of state space coverage), but also provide examples of how the problems were caused, having a much greater impact than a list of issues that could be mostly false positives. Left untamed, lack of correctness of scientific code will have catastrophic consequences in the Exascale era.

Another new category of advanced tools involves parallelization of code and code refactoring/transformation, including acceleration discovery. Refactoring tools will be needed to automatically adapt applications to Exascale environments. Acceleration tools will automatically or semi-automatically, at compile time or at runtime, identify code regions that are suitable for acceleration, outlining them into separate code pieces and transforming them into specialized code for the accelerator hardware.

Given that different tools often share needs (e.g. code browsing, or binary analysis), support for tool components and mechanisms for sharing tool infrastructure will be critical to effectively develop the tools required for Exascale, lowering development costs and delivering improved usability to users.

Exascale Tools Solutions may include, but are not limited to, novel strategies in the areas of:

- Automatic analysis capabilities to measure and analyze thread metrics, concurrency and locality metrics, data movement and energy efficiency, resource utilization and contention, bottlenecks and root causes, correlating results to application representations, at the various levels of the stack;
- Support for new programming models and runtime system, in a closed feedback loop with the hardware architecture, providing insight about elements of the execution environment;
- Novel correctness methods that enable/enforce "correct-by-design" code; Novel debugging methods that identify and mitigate errors, automatically or semi-automatically reducing the problem to some form of hierarchical debugging; and

- Code parallelization, refactoring and transformation methods needed to automatically adapt applications to Exascale environments, including acceleration tools that identify and transform code regions suitable for acceleration into specialized hardware code.

References

[1] DOE ASCR 2011 Exascale Programming Challenges Workshop: http://science.energy.gov/ascr/research/computer-science/programming-challenges-workshop/

[2] DOE ASCR 2011 Exascale Programming Challenges Workshop Report: http://science.energy.gov/~/media/ascr/pdf/program-documents/docs/ProgrammingChallengesWorkshopReport.pdf

[3]DOE ASCR 2011 Exascale Tools Workshop: http://science.energy.gov/ascr/research/computer-science/exascale-tools-workshop/

[4] DOE ASCR 2011 Exascale Tools Workshop Report: http://science.energy.gov/ascr/news-and-resources/program-documents/docs/ExascaleToolsWorkshopReport.pdf

[5] DOE ASCR 2011 Workshop on Architectures I: Exascale and Beyond: Gaps in Research, Gaps in our Thinking, http://www.orau.gov/archI2011/default.htm

[6] DOE ASCR 2011 Workshop on Architectures II: Exascale and Beyond: Configuring, Reasoning, and Scaling, http://www.orau.gov/archII2011/default.htm

[7] Report of the 2011 Workshop on Architectures II: Exascale, and Beyond: Configuring, Reasoning, and Scaling, http://science.energy.gov/~/media/ascr/pdf/program-documents/docs/ArchitecturesIIWorkshopReport.pdf

[8] Vivek Sarkar et al., "Exascale Software Study: Software Challenges in Extreme Scale Systems," DARPA IPTO, September 14, 2009. URL: http://users.ece.gatech.edu/mrichard/ExascaleComputingStudyReports/ECSS%20report%20101909.pdf

[9] Curtis Janssen, Adolfy Hoisie, Thomas Sterling, and John Shalf: "Evaluation, Optimization, and Application of Execution Models for Exascale Computing," http://sites.google.com/site/executionmodelsforexascale/

[10] Bob Lucas, Thomas Sterling, and John Shalf, "Quantifying Overhead in Today's Execution Models" project, https://sites.google.com/site/executionmodelsisilbnl/?pli=1

[11] Mantevo mini-apps, https://software.sandia.gov/mantevo/

[12] C. L. Janssen, H. Adalsteinsson, S. Cranford, J. P. Kenny, A. Pinar, D. A. Evensky, and J. Mayo, "A simulator for large-scale parallel computer architectures", International Journal of Distributed Systems and Technology (IJDST), 1, pp. 57-73, 2010.

[13] Erich Strohmaier et al., "TORCH Computational Reference Kernels: A Testbed for Computer Science Research, University of California, Berkeley, Technical Report, http://www.eecs.berkeley.edu/Pubs/TechRpts/2010/EECS-2010-144.html

Collaborations

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. Collaborative applications submitted from different institutions should clearly indicate they are part of a proposed collaboration and contain the same title, Abstract and Narrative for that research project. In addition, such applications must describe the work and the associated budget for the research effort being performed under the leadership of the Principal Investigator at that participating institution.

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.

Additional Application Requirements

We are looking for strong teams that address multiple components of the software stack. Collaborative applications must carefully consider the fact that we will give priority to applications that have a lean budget, in which overheads are minimized and in which every senior/key personnel has a significant technical contribution to the proposed research.

Each Application must include the following:

1. Description of plans for developing prototypes of the proposed solution;
2. Description of the proposed path to integration and/or interoperation with existing programming environments, including a proposed timeline;
3. Evaluation plan with respect to scalability, programmability, energy efficiency, and performance metrics using compact applications, mini-applications [11], [12] and/or application skeletons [13].

PART II – AWARD INFORMATION

A. TYPE OF AWARD INSTRUMENT.

DOE anticipates awarding Cooperative Agreements under this FOA.

B. ESTIMATED FUNDING.

Awards are expected to be made for a period of three years at a funding level of up to $15,000,000 per year to support multiple awards in Fiscal Year 2012, with out-year support contingent on the availability of appropriated funds and satisfactory progress.

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.

The award size will depend on the number of meritorious applications and the availability of appropriated funds. Collaborative applications requesting less than $500,000 per year are unlikely to be a successful project under this FOA.

D. EXPECTED NUMBER OF AWARDS.

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

E. ANTICIPATED AWARD SIZE.

The award size will depend on the number of meritorious applications and the availability of appropriated funds. The total project size is anticipated to range from $500,000 up to $4,000,000 per year.

F. PERIOD OF PERFORMANCE.

Cooperative Agreements are expected to be made for a period of three years at a funding level appropriate for the proposed scope, with out-year support contingent on the availability of appropriated funds and satisfactory progress.

G. TYPE OF APPLICATION.

DOE will accept new applications under this FOA.

PART III - ELIGIBILITY INFORMATION

A. ELIGIBLE APPLICANTS.

All types of domestic entities are eligible to apply, except other Federal agencies, 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. OTHER ELIGIBILITY REQUIREMENTS.

N/A

PART 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 a Grant Application Package**". Enter the CFDA and/or the funding opportunity number located on the cover of this FOA and then follow the prompts to download the application package.

B. LETTER OF INTENT AND PRE-APPLICATION

1. Letter of Intent (LOI).

LOI DUE DATE: December 21, 2011

Applicants are strongly encouraged to submit a LOI no later than **11:59 pm December 21, 2011**. The LOI should include the following:

1. A cover sheet containing the name, institutional affiliation, e-mail address, and telephone number of the Principal Investigator(s), and Senior/Key personnel expected to be involved in the planned application; and the estimated annual cost and total cost of the project over the three-year project period.

2. A 1-2 pages overview of the research plan.

Letters of Intent will be used to organize and expedite the merit review process. Consequently, the submission of a LOI is strongly encouraged but not required. The absence of a LOI will not negatively affect a thorough evaluation of a responsive formal application submitted in a timely fashion. The LOI should be sent by E-mail as a PDF file to: ascr-cs@science.doe.gov. Please include the phrase “Letter of Intent” in the subject line.

2. Pre-Application.

N/A

C. CONTENT AND FORM OF APPLICATION – SF 424 (R&R)

You must complete the mandatory forms and any applicable optional forms (e.g., SF-LLL-Disclosure of Lobbying Activities) 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 FOA.**

1. SF 424 (R&R)

Complete this form first to populate data in other forms. Complete all the required fields in accordance with the pop-up instructions on the form. The list of certifications and assurances referenced in Field 17 can be found 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.

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."

Project Narrative (Field 8 on the Form).

The project narrative **must not exceed 25 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). EVALUATORS WILL ONLY REVIEW THE NUMBER OF PAGES SPECIFIED IN THE PRECEDING SENTENCE. The font must not be smaller than 11 point.

Please do not submit general letters of support as these are not used in making funding decisions and can interfere with the selection of peer reviewers.

Do not include any Internet addresses (URLs) that provide information necessary to review the application, because the information contained in these sites will not be reviewed. See Part VIII.D for instructions on how to mark proprietary application information. To attach a Project Narrative, click "Add Attachment."

The application narrative should begin with a cover page that includes: the project title, the Lead PI's name and complete contact information.

The cover page must also include the following information (this page will not count in the project narrative page limitation):

Applicant/Institution:
Street Address/City/State/Zip:
Principal Investigator:
Postal Address:
Telephone Number:
Email:
Funding Opportunity Announcement Number: DE-FOA-0000619

DOE/Office of Science Program Office: Office of Advanced Scientific Computing Research (ASCR)
DOE/Office of Science Program Office Technical Contact: Dr. Sonia R. Sachs

Is this a Collaboration? If yes, please list ALL Collaborating Institutions/PIs* and indicate which ones will also be submitting applications. Also indicate the PI who will be the point of contact and coordinator for the combined research activity.

Sample Table for the Lead Institution ($ in thousands)

2012 X-Stack	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Name of the Principal Investigator and Institution	$	$	$	$	$	$
Collaborating Institutions						**Total**
Name of Co-PI and Institution	$	$	$	$	$	$
Name of Co-PI and Institution	$	$	$	$	$	$
Name of Co-PI and Institution	$	$	$	$	$	$
TOTALS	$	$	$	$	$	$

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.

Appendix 1: Biographical Sketch.

Provide a biographical sketch for the project director/principal investigator (PD/PI) and each senior/key person listed in Section A on the R&R Budget form. **Provide the Biographical Sketch information as an Appendix to your project narrative. Do not attach a separate file. The Biographical Sketch Appendix will not count in the project narrative page limitation.**

The biographical information (curriculum vitae) for each person must not exceed 2 pages when printed on 8.5" by 11" paper with 1 inch margins (top, bottom, left, and right) with font not smaller than 11 point and must include:

Education and Training. Undergraduate, graduate and postdoctoral training, provide institution, major/area, degree and year.

Research and Professional Experience: Beginning with the current position list, in chronological order, professional/academic positions with a brief description.

Publications. Provide a list of up to 10 publications most closely related to the proposed project. For each publication, identify the names of all authors (in the same sequence in which they appear in the publication), the article title, book or journal title, volume number, page numbers, year of publication, and website address if available electronically. Patents, copyrights and software systems developed may be provided in addition to or substituted for publications.

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

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

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

Graduate and Postdoctoral Advisors and Advisees: List the names and current organizational affiliations of your graduate advisor(s) and principal postdoctoral sponsor(s) 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. Do not attach a separate file. The Current and Pending Support Appendix will not count in the project narrative page limitation.** Concurrent submission of an application to other organizations for simultaneous consideration will not prejudice its review.

Appendix 3: Bibliography and 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. 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. The Bibliography and References Cited Appendix will not count in the project narrative page limitation.**

Appendix 4: Facilities and 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. **Provide the Facility and Other Resource information as an Appendix to your project narrative. Do not attach a separate file. The Facility and Other Resource 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. The Equipment 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. Do not attach a separate file. The Other Attachment 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. Instead follow the above instructions to include the information as Appendices to the project narrative file (these Appendices will not count in the project narrative page limitation).

3. RESEARCH AND RELATED BUDGET.

Complete the Research and Related Budget form in accordance with the instructions on the form 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).

Budget Justification (Field K on the form).

Provide the required supporting information for the following costs: equipment; domestic and foreign travel; participant/trainees; material 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. 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. SF-LLL Disclosure of Lobbying Activities

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

Summary of Required Forms/Files

Your application must include the following documents:

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.

LOI DUE DATE: December 21, 2011

Applicants are strongly encouraged to submit a LOI no later than **11:59 pm December 21, 2011**. The LOI should include the following:

1. A cover sheet containing the name, institutional affiliation, e-mail address, and telephone number of the Principal Investigator(s), and Senior/Key personnel expected to be involved in the planned application; and the estimated annual cost and total cost of the project over the three-year project period.

2. A 1-2 pages overview of the research plan.

The LOI will be used to organize and expedite the merit review process. Consequently, the submission of a LOI is strongly encouraged but not required. The absence of a LOI will not negatively affect a thorough evaluation of a responsive formal application submitted in a timely fashion. The LOI should be sent by E-mail as a PDF file to: ascr-cs@science.doe.gov. Please include the phrase "Letter of Intent" in the subject line.

2. Pre-Application.

N/A

3. Formal Applications.

APPLICATION DUE DATE: February 6, 2012, 11:59 PM Eastern Time

Formal applications submitted in response to this FOA must be received by **February 6, 2012**, 11:59 PM Eastern Time, to permit timely consideration of awards in Fiscal Year 2012. **You are encouraged to submit your application well before the deadline. APPLICATIONS RECEIVED AFTER THE DEADLINE WILL NOT BE REVIEWED OR CONSIDERED FOR AWARD.**

F. INTERGOVERNMENTAL REVIEW.

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

G. FUNDING RESTRICTIONS.

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

Pre-award Costs**.** Recipients may charge to an award resulting from this FOA 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 Part 600. 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 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.

You must COMPLETE the one-time registration process (all steps) before you can submit your first application through Grants.gov (See www.grants.gov/GetStarted). We recommend that you start this process at least three weeks before the application due date. It may take 21 days or more to complete the entire process. To register with Grants.gov go to "Get Registered" at http://grants.gov/applicants/get_registered.jsp. Use the Grants.gov Organization Registration Checklist at http://www.grants.gov/assets/OrganizationRegCheck.pdf to guide you through the process. IMPORTANT: During the CCR 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).

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 CCR registration annually.

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

PART 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; and (4) the proposed project is responsive to the objectives of the FOA. 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 evaluation criteria which are listed in descending order of importance codified at 10 CFR 605.10(d). Included within each criterion are specific questions that the merit reviewers will be asked to consider.

1) Scientific and/or technical merit of the project

- Does the proposed research significantly advance the state-of-the-art in programming models, languages, compiler, runtime systems, and tools?
- Does the proposed research provide for complete solutions that will address multiple components of the system software stack?
- Does the proposed research clearly addresses scalability, programmability, performance portability, resilience, and energy efficiency?
- Does the proposed research significantly lower the barriers to effectively program Exascale machines?
- What is the likelihood that the applicant can overcome the key challenges and, as warranted, shift research directions in response to promising advances in basic research?

2) Appropriateness of the proposed method or approach

- How well does the research plan address interfaces of the multiple components of the proposed solution?
- Does the research plan contain the development of prototypes of the proposed solution?
- Does the research plan include demonstration of viability of the proposed solution to interoperate with existing programming environment based on MPI+X, and/or to automatically transform from existing codes to new ones?
- Does the research plan include validation strategies using compact, mini-apps, or skeletons of DOE scientific applications?
- Does the research plan contain appropriate performance metrics that will allow progress and contributions to be measured?

- If this is a collaborative application, does it include a management plan that addresses the organization, communications, and coordination of the collaborating teams?

3) Competency of the applicant's personnel and adequacy of the proposed resources

- Do the applicants have a proven record of success in delivering results for advanced computational science research?
- Do the applicants have a proven record of research and development in the disciplines needed for success in projects that involve integration of multiple software stack components?
- Are the roles and intellectual contributions of the Principal Investigator(s), and each senior/key personnel adequately described? Do you consider the contributions of each senior/key personnel of significant value for the project?

4) Reasonableness and appropriateness of the proposed budget

- Is the applicant's requested budget appropriate? Is the budget as lean as it can be to deliver the promised results? Are the budget overheads minimized?
- Does the requested budget support the applicant's specified management structure in a meaningful way?
- Does the applicant have a process for reallocating individuals funds to address changing priorities?
- Is travel budget appropriate? Are video conferencing technologies proposed to reduce the travel budget?

The selection official will consider the following program policy and management factors in the selection process:

- Potential impact of proposed research activities on ASCR Exascale goals in the areas of this FOA.
- Potential for developing synergies and/or relation of the proposed research activities to other research efforts supported by ASCR, particularly co-design;
- Total amount of DOE funds available; and
- A management plan that addresses the organization, communications, and coordination of the collaborating researchers. This plan should include mitigation strategies for foreseeable risks and explain how the project will have sufficient flexibility to adapt to changing priorities, challenges, and resources.

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.

C. ANTICIPATED NOTICE OF SELECTION AND AWARD DATES.

It is anticipated that selections will be completed by April 6, 2012. Awards will be made in Fiscal Year 2012.

PART 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 Part 600; 5. National Policy Assurances to be Incorporated as Award Terms; 6. Budget Summary; and 7. Federal Assistance Reporting Checklist, which identifies the reporting requirements.

For grants and cooperative agreements made to universities, non-profits and other entities subject to Title 2 CFR the Award also includes the Research Terms and Conditions located at: http://www.nsf.gov/bfa/dias/policy/rtc/index.jsp.

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 Part 605 (See: http://ecfr.gpoaccess.gov). Grants and cooperative agreements made to universities, non-profits and other entities subject to Title 2 CFR 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 CCR Requirements

Additional administrative requirements for DOE grants and cooperative agreements are contained in 2 CFR, Part 25 (See: http://ecfr.gpoaccess.gov). Prime awardees must keep their data at CCR current. 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, Part 170. (See: http://ecfr.gpoaccess.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 CCR.

2. Special Terms and Conditions and National Policy Requirements.
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 National Policy Assurances to be Incorporated as Award Terms are located at: http://www.nsf.gov/bfa/dias/policy/rtc/appc.pdf.

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

Statement of Substantial Involvement
Either a grant or cooperative agreement may be awarded under this FOA. If the award is a cooperative agreement, the DOE Contract Specialist and DOE Project Officer will negotiate a Statement of Substantial Involvement prior to award.

C. REPORTING.
Reporting requirements are identified on the Federal Assistance Reporting Checklist, DOE F4600.2, attached to the award agreement. For a sample Checklist, see http://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms.

PART VII - QUESTIONS/AGENCY CONTACTS

A. QUESTIONS

Questions regarding the content of the FOA must be submitted through the FedConnect portal. You must register with FedConnect to respond as an interested party to submit questions, and to view responses to questions. It is recommended that you register as soon after release of the FOA as possible to have the benefit of all responses. More information is available at: https://www.fedconnect.net/FedConnect/PublicPages/FedConnect_Ready_Set_Go.pdf. DOE will try to respond to a question within 3 business days, unless a similar question and answer have already been posted on the website.

Applications submitted through FedConnect will not be accepted.

Questions relating to the 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.

B. AGENCY CONTACTS:

Technical/Scientific Program Contacts:

Program Manager: Dr. Sonia Sachs, (301) 903-0060
Office of Advanced Scientific Computing Research, SC-21.1
E-mail: Sonia.sachs@science.doe.gov

Program Manager: Dr. Lenore Mullin, (301) 903-7113
Office of Advanced Scientific Computing Research, SC-21.1
E-mail: Lenore.mullin@science.doe.gov

PART 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 U.S.C. 5908 provides that title to such inventions vests in the United States, except where 35 U.S.C. 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 784.12, http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title10/10cfr784_main_02.tpl.

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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.

N/A

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.