Program Announcement
To DOE National Laboratories

LAB 11-589

Office of Science

Office of Advanced Scientific Computing Research (ASCR)

Scientific Discovery through Advanced Computing Institutes: Scientific Data Management, Analysis and Visualization

GENERAL INQUIRIES ABOUT THIS LAB ANNOUNCEMENT SHOULD BE DIRECTED TO:

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SUMMARY:

The Office of Advanced Scientific Computing Research (ASCR) of the Office of Science (SC), U.S. Department of Energy (DOE), hereby announces its interest in receiving proposals to the Scientific Discovery through Advanced Computing (SciDAC) program for a SciDAC Institute for scientific data management, analysis and visualization. The proposed Institute will serve as a single point of contact for scientists participating in Scientific Computation Application Partnerships (hereafter, Partnerships) seeking ASCR-supported collaborators who will work with them to more efficiently and effectively manage, analyze, visualize and understand their scientific data. As a focal point for interdisciplinary collaboration, the Institute will be the primary mechanism for transferring technical solutions into operational use by application scientists on leadership-class computing facilities over the next 5 years. More specific information is included under SUPPLEMENTARY INFORMATION below.

A companion Funding Opportunity Announcement (FOA) DE-FOA-0000589 will also be posted at grants.gov and on the SC Grants and Contracts web site at: http://www.science.doe.gov/grants.

1. Letter of Intent.

Each Director for a proposed SciDAC Institute is strongly encouraged to submit a Letter of Intent (LOI) by Wednesday, October 12, 2011, 11:59 P.M. Eastern Time. The LOI should include the following:

1. A cover sheet containing the name and mailing address of the Director's institution; the planned title of the SciDAC Institute; the estimated annual cost and total cost of the project over the five-year project period; the name, institutional affiliation, e-mail address, and telephone number of the SciDAC Institute Director, Principal Investigator(s), and Senior/Key personnel expected to be involved in the planned project.
2. A one-page overview of the strategic plan for the proposed SciDAC Institute, including the vision, goals and key objectives.
3. A one-page 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 proposal submitted in a timely fashion. The LOI should be sent by E-mail as a PDF file to: scidac-institutes@ascr.doe.gov. Please include the phrase "Letter of Intent" in the subject line.

PROPOSAL DUE DATE:

Formal proposals submitted in response to this Program Announcement must be submitted from the Laboratory to the site office through Searchable FWP by **November 9, 2011, 11:59 p.m. Eastern Time**, to be accepted for merit review and to permit timely consideration for award in Fiscal Year 2012. **Each proposal should be in a single PDF file. The first few pages of the PDF should be the Field Work Proposal followed in the same PDF by the full technical proposal. You are encouraged to transmit your proposal well before the deadline. PROPOSALS RECEIVED AFTER THE DEADLINE WILL NOT BE REVIEWED OR CONSIDERED FOR AWARD.**

SUBMISSION INSTRUCTIONS:

LAB administrators should submit the entire LAB proposal and Field Work Proposal (FWP) via searchable FWP (https://www.osti.gov/fwp). Questions regarding the appropriate LAB administrator or other questions regarding submission procedures can be addressed to the Searchable FWP Support Center. All submission and inquiries about this Program Announcement must reference Program Announcement LAB 11-589.

SUPPLEMENTARY INFORMATION:

The collective mission of the SciDAC Institutes is to provide intellectual resources in applied mathematics and computer science, expertise in algorithms and methods, and scientific software tools to advance scientific discovery through modeling and simulation in areas of strategic importance to the Office of Science and the National Nuclear Security Administration (NNSA).

Funding opportunities for SciDAC science domains will be announced through several forthcoming Program Announcements to DOE National Laboratories (Program Announcement) and FOAs. These Program Announcements and FOAs, issued by ASCR's SciDAC partners, provide opportunities to establish collaborative projects among DOE application scientists and the SciDAC Institutes.

The SciDAC program was initiated in 2001 as a partnership involving all of the SC program offices. The objective was to dramatically accelerate progress in scientific computing that delivers breakthrough scientific results through partnerships comprised of applied mathematicians, computer scientists, and scientists from other disciplines. The SciDAC program was re-competed in 2006, and the partnerships were extended to include the DOE NNSA and the National Science Foundation (NSF). Through partnerships with ASCR-funded mathematicians and computer scientists, SciDAC applications pursued computational solutions to challenging problems in climate science, fusion research, high energy physics, nuclear physics, astrophysics, materials science, chemistry, particle accelerators, biology and the reactive subsurface flow of contaminants through groundwater. Today the SciDAC program is recognized as the leader in accelerating the use of high-performance computing to advance the state of knowledge in science applications.

The development of SciDAC tools and resources, funded under this Program Announcement, is intended for computational systems such as those existing and planned for at the Oak Ridge and Argonne Leadership Computing Facilities, the National Energy Research Scientific Computing Center, and similar world-class computing facilities **over the next 5 years**. Specific goals and objectives for the SciDAC Institutes are:

- Tools and resources for lowering the barriers to effectively use state-of-the-art computational systems;
- Mechanisms for taking on computational grand challenges across different science application areas;
- Mechanisms for incorporating and demonstrating the value of basic research results from Applied Mathematics and Computer Science; and
- Plans for building up and engaging our nation's computational science research communities.

In a relatively short time, science has shifted from data scarcity to an overwhelming abundance of data, as simulations and experiments generate many petabytes of data, with some sciences facing exabytes of data near term. Exponential growth in data generation rates result from a combination of improved sensors, refinements in scale, and improved availability of and access to high-performance computing systems. For example, the Large Hadron Collider (LHC) is expected to produce roughly 15 petabytes of data annually over its estimated 15 year lifespan (http://public.web.cern.ch/Public/en/LHC/Computing-en.html).

The proposed Institute will serve as a single point of contact for scientists participating in Partnerships seeking ASCR-supported collaborators who will work with them to more efficiently and effectively manage, analyze, visualize and understand their scientific data. As a focal point for interdisciplinary collaboration, the Institute will be the primary mechanism for transferring technical solutions into operational use by application scientists on leadership-class computing facilities over the next 5 years.

The Institute will leverage research and mature technologies from basic research, making them accessible to application scientists, assisting in their use, and supporting scientists in understanding the results. Technologies of potential interest cover a broad range but, taken together, should result in a comprehensive portfolio of capabilities that is responsive to the SciDAC mission. A proposed Institute must describe the nature and range of collaborations and capabilities that it would make available to application scientists.

Research may be required to transform technologies from the proof-of-concept stages supported in basic research into usable and useful systems that support scientific discovery. Research topics may include, but are not limited to,

- Research to evaluate and further mature candidate solutions and adapt them for use by application scientists;
- Integration of new approaches and/or capabilities into existing tools or technologies to meet the challenges of real data at scale for diverse science applications; and/or
- Usability evaluation and iterative design of user interfaces for scientific data management, analysis and visualization systems to make the technologies more accessible to scientists.

For the purposes of this Announcement, out of scope are

- Efforts aimed at porting existing scientific data management, analysis and visualization applications/solutions to new computing platforms that won't be delivered within the next five years;
- Research aimed at creating new scientific data management, analysis and visualization applications;
- Delivery of technical solutions as a service rather than as a collaborative process of engagement; and
- Research aimed at exascale computing systems.

Sharing, re-use, and re-purposing of scientific data and integration of data from multiple simulations and multiple disciplines are required to address mission-critical challenges in complex systems. Analysis of massive heterogeneous data sets is required, for example, for understanding the impact of stockpile decay on containment materials over decades or understanding the causes and potential impacts of climate change. Integration and/or comparison of data from simulations and observations are necessary for model validation, as well as requiring analysis in their own right.

The value of scientific data is realized only when data are effectively analyzed and results are presented in an understandable way. The challenges of analyzing massive scientific data sets are compounded by data complexity that results from heterogeneous methods and devices for data generation and capture and the inherently multi-scale, multi-physics nature of many sciences, resulting in data with hundreds of attributes or dimensions and spanning multiple spatial and temporal scales. Data analysis may be intended to confirm or deny a known hypothesis, but data may also be analyzed in hopes of finding previously unknown patterns or features – to discover the unexpected. Comparative analysis may also be required to determine the similarities among and differences between data from multiple runs of a simulation or between simulation output and experimental data.

Visual analysis systems that enable interaction between the scientist users, the data analysis system, and the data are critical for supporting scientific discovery and understanding, as well as enhancing communication about science outcomes with the science community, policy makers, and the public.

A particular challenge for a proposed SciDAC Institute is the need to provide sufficient flexibility to incorporate new data management, analysis and visualization technologies and solutions that arise over the life of the Institute, as well as to meet the changing needs of application scientists and respond to architectural advances over the next 5 years.

One of the primary metrics for the success of a SciDAC Institute is the extent to which its deliverables are used by application scientists. An equally important metric is the extent to which Institute researchers actively collaborate and leverage their expertise in achieving that success. This Program Announcement describes the process by a proposed Institute is to be developed, submitted, and merit reviewed. Although the work of a proposed Institute is not science application-specific, it is expected – for the purposes of this Program Announcement – to be application-, architecture-, and Institutes-aware.

Institutes-aware. The SciDAC Institutes provide a foundation for efforts by applied mathematicians and computer scientists to systematically address technical challenges that are inherent to the scale of new architectures and that are common across a wide range of science applications. A proposed Institute must not only make a compelling case for its own intrinsic capabilities, but also describe processes for effectively leveraging the capabilities of the recently awarded SciDAC Institutes. (http://science.energy.gov/ascr/research/scidac/scidac-institutes/)

- **FASTMath** – Frameworks, Algorithms, and Scalable Technologies for Mathematics (Director: Lori Diachin, Lawrence Livermore National Laboratory). Topics covered include: structured and unstructured mesh tools and mesh-solver interfaces, linear and nonlinear solvers, eigensolvers, particle methods, time integration, differential and variational inequalities
- **QUEST** – Quantification of Uncertainty in Extreme Scale Computations (Director: Habib Najm, Sandia National Laboratories). Topics covered include: forward uncertainty propagation, reduced stochastic representation, inverse problems, experimental design and model validation, and fault tolerance
- **SUPER** – Sustained Performance, Energy and Resilience (Director: Robert Lucas, University of Southern California). Topics covered include: performance engineering (including modeling and auto-tuning), energy efficiency, resilience and optimization

An important benefit of the Institutes and Partnerships is that innovative science projects can be accommodated by the Institutes' pooling of a broad range of computational skills that is otherwise not readily available to DOE domain scientists. To this end, a proposed SciDAC Institute must include an explanation of its relationship to the three recently awarded Institutes, as well as a plan for outreach to and support of Partnerships.

Architecture-aware Scientific Data Management, Analysis and Visualization. Over the next 5 years, the main architectural features of existing and planned computing environments include: heterogeneous nodes (CPUs, GPUs), different memory hierarchies, and varying trade-off costs for computation versus data movement. Tools and methodologies for coping with and taking full

advantage of such architectural complexities are an important practical consideration. A roadmap, factsheet and listing of state-of-the-art computational systems are provided at:

- Petascale Science Delivered, Oak Ridge Leadership Computing Facility Annual Report 2009, http://www.olcf.ornl.gov/wp-content/uploads/2010/03/OLCFAR2009.pdf
- Argonne Leadership Computing Facility Fact Sheet, 2011, http://www.alcf.anl.gov/news/media_files/alcf-fctsht-0411_r6.pdf
- NERSC computational systems, http://www.nersc.gov/users/computational-systems/

A proposed Institute should describe its plans with respect to these challenges and resources.

Application-aware. The application-aware features of a SciDAC Institute are essential in ensuring that its deliverables are used by application scientists (a primary metric of success). Nevertheless, it is difficult to anticipate the near-term and changing computational science needs of domain scientists. This observation motivates the need to develop intellectual resources and tools to meet cross-cutting computational science needs for DOE and SC missions.

Management structure. A proposed SciDAC Institute must describe a management structure that enables it to function efficiently and to collaborate effectively and quantifiably with the science applications as well as with each other (see Post-Award process below). Institute structure and management must be sufficiently flexible to adapt quickly to changing technical challenges and scientific needs. Each Institute must identify a Director, Principal Investigator(s), and Senior/Key Personnel. Typical duties, responsibilities and authorities for each category are provided below:

- **Institute Director** - The SciDAC Institute Director is the Lead Principal Investigator and must be employed by the Lead institution. The SciDAC Institute Director will serve as the primary contact responsible for communications with the DOE Program Officer on behalf of all of the Principal Investigators in the Institute.
- **Principal Investigator** - A Principal Investigator is the individual designated by the research organization and empowered with the appropriate level of authority and responsibility for the proper conduct of the research within that organization. These authorities and responsibilities include the appropriate use of funds and administrative requirements such as the submission of scientific progress reports to DOE. When an organization designates more than one Principal Investigator, it identifies them as individuals who share the authority and responsibility for leading and directing the research, intellectually and logistically.
- **Senior/Key Personnel** - A senior/key person is an individual who contributes in a substantive, measurable way to the scientific/technical development or execution of the project. This definition includes, but is not limited to, the SciDAC Institute Director and the Principal Investigator(s).

Post-Award process. Upon notification of award, the Institute Director will be asked to serve with the three previously awarded Institute Directors on a SciDAC Institutes Directors Executive Council. This group will be chartered to develop and submit an operating plan for the SciDAC Institutes. The plan will describe the processes and procedures to be used for coordination and communication among the Institutes. The plan will also describe the process used by each Institute to review activities within that Institute, re-prioritize as appropriate and communicate those results to all of the Institutes, the Executive Council, and ASCR. As Partnerships (i.e., ASCR and other DOE Programs) develop, the Executive Council will document its approach for

working with these Partnerships and present it to DOE. Additional guidance will be provided in the award notification letter.

SC Application Partnerships
New FOAs and Program Announcements will be issued by each SC office and in partnership with ASCR. In each case, a successful Partnership with SciDAC Institutes will:

1. Exploit leadership class computing resources to advance scientific frontiers in an area of strategic importance to SC, and
2. Effectively link to the intellectual resources in applied mathematics and computer science, expertise in algorithms and methods, and scientific software tools at one or more SciDAC Institutes.

For official postings see the Office of Science Grants and Contracts web site, http://www.science.doe.gov/grants.

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 proposals submitted from different institutions, which are directed toward a single SciDAC Institute, should clearly indicate they are part of a proposed collaboration and contain the same title, Abstract and Narrative for that SciDAC Institute research project. In addition, such proposals 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.

Program Funding: Awards are expected to be made for a period of five years at a funding level of up to $5,000,000 per year to support one SciDAC Institute award in Fiscal Year 2012, with out-year support contingent on the availability of appropriated funds and satisfactory progress.

Although a SciDAC Institute may be supported by a single award, ASCR expects an Institute will be a collaboration comprised of several separate awards. ASCR reserves the right to make fewer awards than would be possible at $5,000,000 per year, if an insufficient number of proposals are judged to be of suitable scientific quality or of sufficient relevance to the programs described above.

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

The instructions and format described below should be followed. You must reference Program Announcement LAB 11-589 on all submissions and inquiries about this program.

OFFICE OF SCIENCE
GUIDE FOR PREPARATION OF SCIENTIFIC/TECHNICAL PROPOSALS
TO BE SUBMITTED BY NATIONAL LABORATORIES

Proposals from DOE National Laboratories submitted to the Office of Science (SC) as a result of this Program Announcement will follow the Department of Energy Field Work Proposal process with additional information requested to allow for scientific/technical merit review. The following guidelines for content and format are intended to facilitate an understanding of the requirements necessary for SC to conduct a merit review of a proposal. Please follow the guidelines carefully, as deviations could be cause for declination of a proposal without merit review.

1. Evaluation Criteria

Proposals 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. 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**
   a. Does the proposed research provide the capability to accelerate scientific discovery in areas of strategic importance to DOE?
   b. Does the research plan contain appropriate performance metrics that will allow progress and contributions to be measured?
   c. 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**
   a. Does the proposed research employ state-of-the-art approaches and lower the barriers to effectively use leadership-scale computing resources available to DOE researchers?
   b. Has the applicant identified commonalities in multiple (and different) scientific applications for addressing computational grand challenges and that will enable the Institute to structure its research plan in an efficient manner?
   c. Does the applicant have a process for leveraging basic research advances from Applied Mathematics and Computer Science?
   d. Does the applicant have appropriate plans for outreach to the broader computational science community?

3. **Competency of Applicant's Personnel and Adequacy of Proposed Resources**
   a. Does the applicant have a proven record of success in managing diverse teams of scientific and technical experts and delivering results for advanced computational science research?
   b. Do the applicant's senior/key personnel have a proven record of research and development in the disciplines needed for success in projects of this complexity and magnitude?

c. Are the roles and intellectual contributions of the SciDAC Institute Director, Principal Investigator(s), and each senior/key personnel adequately described?

4. **Reasonableness and Appropriateness of the Proposed Budget**
   a. Is the applicant's requested budget appropriate?
   b. Does the requested budget support the applicant's specified management structure in a meaningful way?
   c. Does the applicant have a process for reallocating funds to address changing priorities?

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

a. Potential impact of proposed research activities on SciDAC goals;
b. Relation of the proposed research activities to other research efforts supported by ASCR;
c. Potential for developing synergies with other SciDAC Institutes and Partnerships;
d. Total amount of DOE funds available; and
e. A management plan that addresses the organization, communications, and coordination of the Institutes. This plan should include mitigation strategies for foreseeable risks and explain how the Institute 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 Program Announcement and the agency's programmatic needs. Note that external peer reviewers are selected with regard to both their scientific expertise and the absence of conflict-of-interest issues. Both Federal and non-Federal reviewers may be used, and submission of a proposal constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

2. Summary of Proposal Contents

- Field Work Proposal (FWP) Format (Reference DOE Order 412.1A) (DOE ONLY)
- Proposal Cover Page
- Table of Contents
- Budget (DOE Form 4620.1) and Budget Explanation
- Abstract (one page)
- Narrative (main technical portion of the proposal, including background/introduction, proposed research and methods, timetable of activities, and responsibilities of key project personnel – 25-page limit
- Literature Cited
- Biographical Sketch(es)
- Description of Facilities and Resources
- Other Support of Investigator(s)
- Appendix (optional)

2.1 Submission Instructions

LAB administrators should submit the entire LAB proposal and Field Work Proposal (FWP) via searchable FWP (https://www.osti.gov/fwp). Questions regarding the appropriate LAB administrator or other questions regarding submission procedures can be addressed to the Searchable FWP Support Center. All submission and inquiries about this Program Announcement must reference Program Announcement to DOE National Laboratories LAB 11-589. Full proposals submitted in response to this Program Announcement must be submitted to the searchable FWP database no later than 11:59 pm, Eastern Time, **November 9, 2011**. It is important that the entire peer reviewable proposal be submitted to the searchable FWP system as a single PDF file attachment.

3. Detailed Contents of the Proposal

Adherence to type size and line spacing requirements is necessary for several reasons. No researcher should have the advantage, or by using small type, of providing more text in his or her proposal. Small type may also make it difficult for reviewers to read the proposal. Proposals must have 1-inch margins at the top, bottom, and on each side. Type sizes must be at least 11 point. Line spacing is at the discretion of the researcher but there must be no more than 6 lines per vertical inch of text. Pages should be standard 8 1/2" x 11" (or metric A4, i.e., 210 mm x 297 mm).

3.1 Field Work Proposal Format (Reference DOE Order 412.1A) (DOE ONLY)

The Field Work Proposal (FWP) is to be prepared and submitted consistent with policies of the investigator's laboratory and the local DOE Operations Office. Additional information is also requested to allow for scientific/technical merit review.

3.2 Proposal Cover Page

The following proposal cover page information may be placed on plain paper. No form is required.

Title of proposed project:
SC Program Announcement title and number: **Scientific Discovery through Advanced Computing Institutes: Scientific Data Management, Analysis and Visualization - LAB 11-589**
Name of laboratory:
Name of principal investigator (PI):
Position title of PI:
Mailing address of PI:
Telephone of PI:
Fax number of PI:
Electronic mail address of PI:
Name of official signing for laboratory*:
Title of official:
Fax number of official:

Telephone of official:
Electronic mail address of official:
Requested funding for each year; total request:
Use of human subjects in proposed project:
If activities involving human subjects are not planned at any time during the proposed project period, state "No"; otherwise state "Yes", provide the IRB Approval date and Assurance of Compliance Number and include all necessary information with the proposal should human subjects be involved.
Use of vertebrate animals in proposed project:
If activities involving vertebrate animals are not planned at any time during this project, state "No"; otherwise state "Yes" and provide the IACUC Approval date and Animal Welfare Assurance number from NIH and include all necessary information with the proposal.
Signature of PI, date of signature:
Signature of official, date of signature*:

* The signature certifies that personnel and facilities are available as stated in the proposal, if the project is funded.

3.3 Table of Contents

Provide the initial page number for each of the sections of the proposal. Number pages consecutively at the bottom of each page throughout the proposal. Start each major section at the top of a new page. Do not use unnumbered pages, and do not use suffices, such as 5a, 5b.

3.4 Budget and Budget Explanation

A detailed budget is required for the entire project period and for each fiscal year. It is preferred that DOE's budget page, Form 4620.1 be used for providing budget information*. Modifications of categories are permissible to comply with institutional practices, for example with regard to overhead costs.

A written justification of each budget item is to follow the budget pages. For personnel this should take the form of a one-sentence statement of the role of the person in the project. Provide a detailed justification of the need for each item of permanent equipment. Explain each of the other direct costs in sufficient detail for reviewers to be able to judge the appropriateness of the amount requested.

Further instructions regarding the budget are given in section 4 of this guide.

* Form 4620.1 is available at web site: http://www.science.doe.gov/grants/budgetform.pdf

3.5 Abstract

Summarize the proposal in one page. Give the project objectives (in broad scientific terms), the approach to be used, and what the research is intended to accomplish. State the hypotheses to be tested (if any). At the top of the abstract give the lead DOE National Laboratory, project title, names of all the investigators and their institutions, and contact information for the principal investigator, including e-mail address.

3.6 Narrative (main technical portion of the proposal, including background/introduction, proposed research and methods, timetable of activities, and responsibilities of key project personnel).

The narrative comprises the research plan for the project and is limited to a **maximum of 25 pages**. 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 methods 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 25-page technical information section provide a complete description of the proposed work, because reviewers are not obliged to read the Appendices. Proposals exceeding these page limits may be rejected without review or the first 25 pages may be reviewed without regard to the remainder.

The page count of 25 does not include the Cover Page and Budget Pages, the Title Page, the biographical material and publication information, or any Appendices. However, it is important that the 25-page technical information section provide a complete description of the proposed work, since reviewers are not obliged to read the Appendices. 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.

Background

Background – explanation of the importance and relevance of the proposed work.

Proposed Research and Tasks

In addition to the technical description of the proposed work and tasks, include a discussion of schedule, milestones, and deliverables.

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

* Note that collaborating proposals must be submitted separately. However, if you are submitting as a Lead Institution, in addition to meeting all criteria for submitting a peer reviewable proposal, please provide the following information about the SciDAC Institute in the form of a table as shown below:

- Name of the SciDAC Institute and the Institute Director
- Identify the collaborating Institutions and the Principal Investigators at each Institution
- Proposed annual budget for the SciDAC Institute and for each collaborating Institution

Sample Table for the Lead Institution ($ in thousands)

SciDAC Institute	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Name of the SciDAC Institute and the Institute Director	$	$	$	$	$	$
Collaborating Institutions						
(Start with Lead Institution) Name of Institution and PI	$	$	$	$	$	$
Name of Institution and PI	$	$	$	$	$	$
Name of Institution and PI	$	$	$	$	$	$
TOTALS	$	$	$	$	$	$

If you are submitting a proposal as a collaborator within a SciDAC Institute, please include the name of the SciDAC Institute in the title of your proposal, and identify the Lead Institution and Institute Director in your project summary.

3.7 Literature Cited

Give full bibliographic entries for each publication cited in the 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. Principal investigators should be especially careful to follow scholarly practices in providing citations for source materials relied upon when preparing any section of the proposal.

3.8 Biographical Sketches

This information is required for senior personnel at the institution submitting the proposal and at all subcontracting institutions (if any). The biographical sketch is limited to a maximum of two pages for each investigator 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 five professional and scholarly activities related to the effort proposed.

To assist in the identification of potential conflicts of interest or bias in the selection of reviewers, the following information must also be provided in each biographical sketch.

> *Collaborators and Co-editors:* A list of all persons in alphabetical order (including their current organizational affiliations) who are currently, or who have been, collaborators or co-authors with the investigator on a research project, book or book article, report, abstract, or paper during the 48 months preceding the submission of the proposal. For publications or collaborations with more than 10 authors or participants, only list those individuals in the core group with whom the Principal Investigator interacted on a regular basis while the research was being done. Also, include those individuals who are currently or have been co-editors of a special issue of a journal, compendium, or conference proceedings during the 24 months preceding the submission of the proposal. Finally, list any individuals who are not listed in the previous categories with whom you are discussing future collaborations. If there are no collaborators or co-editors to report, this should be so indicated.
>
> *Graduate and Postdoctoral Advisors and Advisees:* A list of the names of the individual's own graduate advisor(s) and principal postdoctoral sponsor(s), and their current organizational affiliations. A list of the names of the individual's graduate students and postdoctoral associates during the past five years, and their current organizational affiliations.

3.9 Description of Facilities and Resources

Facilities to be used for the conduct of the proposed research should be briefly described. Indicate the pertinent capabilities of the institution, including support facilities (such as machine shops), that will be used during the project. List the most important equipment items already available for the project and their pertinent capabilities. Include this information for each subcontracting institution (if any).

3.10 Other Support of Investigators

Other support is defined as all financial resources, whether Federal, non-Federal, commercial, or institutional, available in direct support of an individual's research endeavors. Information on active and pending other support is required for all senior personnel, including investigators at collaborating institutions to be funded by a subcontract. For each item of other support, give the organization or agency, inclusive dates of the project or proposed project, annual funding, and level of effort (months per year or percentage of the year) devoted to the project.

3.11 Appendix

Information not easily accessible to a reviewer may be included in an appendix, but **do not use the appendix to circumvent the page limitations of the proposal.** 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 proposal proper.

The appendix may contain the following items: up to five publications, manuscripts accepted for publication, abstracts, patents, or other printed materials directly relevant to this project, but not generally available to the scientific community. If letters of endorsement are included in a proposal, they will be removed before the proposal is submitted for review.

4. Detailed Instructions for the Budget (DOE Form 4620.1 "Budget Page" may be used).

4.1 Salaries and Wages

List the names of the principal investigator and other key personnel and the estimated number of person-months for which DOE funding is requested. Proposers should list the number of postdoctoral associates and other professional positions included in the proposal and indicate the number of full-time-equivalent (FTE) person-months and rate of pay (hourly, monthly or annually). For graduate and undergraduate students and all other personnel categories such as secretarial, clerical, technical, etc., show the total number of people needed in each job title and total salaries needed. Salaries requested must be consistent with the institution's regular practices. The budget explanation should define concisely the role of each position in the overall project.

4.2 Equipment

DOE defines equipment as "an item of tangible personal property that has a useful life of more than two years and an acquisition cost of $50,000 or more." Special purpose equipment means equipment which is used only for research, scientific or other technical activities. Items of needed equipment should be individually listed by description and estimated cost, including tax, and adequately justified. Allowable items ordinarily will be limited to scientific equipment that is not already available for the conduct of the work. General purpose office equipment normally will not be considered eligible for support.

4.3 Domestic Travel

The type and extent of travel and its relation to the research should be specified. Funds may be requested for attendance at meetings and conferences, other travel associated with the work and subsistence. In order to qualify for support, attendance at meetings or conferences must enhance the investigator's capability to perform the research, plan extensions of it, or disseminate its results. Consultant's travel costs also may be requested.

4.4 Foreign Travel

Foreign travel is any travel outside Canada and the United States and its territories and possessions. Foreign travel may be approved only if it is directly related to project objectives.

4.5 Other Direct Costs

The budget should itemize other anticipated direct costs not included under the headings above, including materials and supplies, publication costs, computer services, and consultant services (which are discussed below). Other examples are: aircraft rental, space rental at research establishments away from the institution, minor building alterations, service charges, and fabrication of equipment or systems not available off- the-shelf. Reference books and periodicals may be charged to the project only if they are specifically related to the research.

a. Materials and Supplies

The budget should indicate in general terms the type of required expendable materials and supplies with their estimated costs. The breakdown should be more detailed when the cost is substantial.

b. Publication Costs/Page Charges

The budget may request funds for the costs of preparing and publishing the results of research, including costs of reports, reprints page charges, or other journal costs (except costs for prior or early publication), and necessary illustrations.

c. Consultant Services

Anticipated consultant services should be justified and information furnished on each individual's expertise, primary organizational affiliation, daily compensation rate and number of days expected service. Consultant's travel costs should be listed separately under travel in the budget.

d. Computer Services

The cost of computer services, including computer-based retrieval of scientific and technical information, may be requested. A justification based on the established computer service rates should be included.

e. Subcontracts

Subcontracts should be listed so that they can be properly evaluated. There should be an anticipated cost and an explanation of that cost for each subcontract. The total amount of each subcontract should also appear as a budget item.

4.6 Indirect Costs

Explain the basis for each overhead and indirect cost. Include the current rates.