

**Program Announcement
To DOE National Laboratories**

LAB 11-588

**Office of Science
Office of Biological and Environmental Research (BER)
and
Office of Advanced Scientific Computing Research (ASCR)**

***Scientific Discovery through Advanced Computing:
Scientific Computation Application Partnerships
in Earth System Science***

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

Technical/Scientific Program Contacts:

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SUMMARY: The Office of Biological and Environment Research (BER) and the Office of Advanced Scientific Computing Research (ASCR) of the Office of Science (SC), U.S. Department of Energy (DOE), hereby announces their interest in receiving proposals to the Scientific Discovery through Advanced Computing (SciDAC) program for SciDAC Scientific Computation Application Partnerships in Earth System Science (hereafter, Partnerships) in support of BER's Earth System Modeling research.

A companion Funding Opportunity Announcement DE-FOA-0000588 for collaborative-only applications will also be posted.

PREPROPOSAL: (Required)

Potential proposers from the lead DOE National Laboratory are **REQUIRED** to submit a brief preproposal, referencing Program Announcement LAB 11-588 for receipt by DOE by 4:30 p.m., Eastern Time, October 17, 2011. The preproposal will be reviewed for conformance with the guidelines presented in this Announcement and suitability in the technical areas specified in this Announcement. A response to the preproposal encouraging or discouraging formal proposals will be communicated to the proposers by October 28, 2011. Proposers who have not received a response regarding the status of their preproposal by this date are responsible for contacting the program to confirm this status.

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

Preproposals referencing Program Announcement LAB 11-588 should be sent as PDF file attachments via e-mail to: SCSciDACCLIMATE2012@science.doe.gov with "Preproposal LAB 11-588" as the subject. **No FAX or mail submission of preproposals will be accepted.**

The preproposals should consist of two to three pages of narrative describing the research objectives, the technical approach, the proposed team members, their expertise and their respective anticipated science program (BER or ASCR). The intent in requesting a preproposal is to save the time and effort of proposers in preparing and submitting a formal project proposal that may be inappropriate for the program. Preproposals will be reviewed relative to the scope and research needs as outlined in the summary paragraph and in the SUPPLEMENTARY INFORMATION. The preproposal should also include a cover sheet that identifies the title of the project, the institution or organization, principal investigator name, telephone number, fax number, e-mail address and the amount of funding requested for each year for the project for each funded institution. No biographical data need be included, nor is an institutional endorsement necessary. Since among the purposes of the preproposal is to facilitate BER and ASCR in planning the merit review and the selection of peer-reviewers without conflicts of interest, it is important that proposers ensure their list of supported or unsupported participants is as comprehensive as possible.

PROPOSAL DUE DATE:

Formal proposals submitted in response to this Program Announcement to DOE National Laboratories must be submitted from the Laboratory to the site office through Searchable FWP by **Monday, December 5, 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. Only those proposers that receive notification from DOE encouraging a formal proposal may submit full proposals. **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 11-588.

SUPPLEMENTARY INFORMATION:

BER Climate Modeling Objectives

BER's Earth System Modeling (ESM) research (<http://science.energy.gov/ber/research/cesd/earth-system-modeling-program>), within the Climate and Environmental Sciences Division (CESD), aims to advance the simulation and predictive capabilities of state-of-science climate modeling. New approaches are needed to increase the spatial resolution, develop and incorporate refinements to physical process representation, and enhance quantification of uncertainty and model validation. The accuracy and skill of climate models requires improvements to model atmosphere, ocean, land and cryosphere components. There is ongoing need for improved methods to parameterize or resolve, and couple, components and features such as clouds, atmospheric aerosols and chemistry, carbon cycle, ocean dynamics, land surface processes, sea and land ice. Development of these model components are expected to be accompanied by comparison with scale-appropriate measurements. Further information on the ESM research priorities within CESD may be found at: http://science.energy.gov/~media/ber/pdf/Climate_strategic_plan.pdf.

Proposals in response to this Announcement may therefore focus on improving climate system models or their components to make them more accurate and computationally efficient. This may include improved or new process representation of the model physical and biogeochemical components, or numerical formulations for high resolution modeling. Examples could include development of components or development of scale-aware parameterizations for atmospheric, oceanic, terrestrial or cryospheric systems. High-resolution formulations could include unstructured or adaptive grids or other innovative techniques for resolving convection/eddy dynamics. Projects may include focus on ESM component coupling and exchange.

Projects are particularly encouraged in the following, with funding allocation of roughly 3 to 1 between the following two items:

- **Development of physics and dynamics for atmosphere, ocean or ice sheets to run efficiently and accurately using high resolution or unstructured grids.** Variable mesh approaches may be developed and improved to resolve features such as cloud dynamics, ocean eddies and ice sheet dynamics. Previous BER-ASCR SciDAC-supported efforts have helped to launch adaptive mesh capabilities; however, implementation of these in climate simulations continues to pose significant challenges. For variable resolution models, it is crucial that the physical components perform accurately across scales, transitioning from hydrostatic to non-hydrostatic, and from cloud-resolving or eddy-resolving to parameterized physics as appropriate. Physical schemes for components such

as clouds, convection, eddies, high-stress regions of ice sheets, etc. need to be developed, tested and made computationally efficient in order to move climate modeling forward to the next generation of accuracy and performance for long-term climate simulations. New solvers may be considered to improve computational accuracy and performance. Computational bottlenecks in process or component coupling and in model input/output should also be targeted to speed the model calculations.

- **Development of efficient and accurate schemes for simulating atmospheric or oceanic chemical or biogeochemical tracers.** The next generation of climate simulations requires that atmospheric aerosols/chemistry and oceanic biogeochemistry interact with the climate systems. However this typically involves transport and transformation of multiple species, often with non-uniform distributions, greatly increasing the time required for climate calculations. Methods are sought to speed tracer transport, to incorporate tracer processes in new physics or mesh frameworks, and to improve or speed processes such as coupling between aerosols and clouds, aerosols and chemistry, or oceanic biogeochemistry.

The most competitive projects will include:

- **Development and application of methods to characterize uncertainty in climate simulations.** Climate model uncertainty derives from a complex combination of uncertainty regarding choice of model parameters, choice of model parameterization, model complexity, and sparse and uncertain measurement constraint. Analysis of climate model uncertainty could be advanced by collaboration among experts in the mathematical, computational and climate sciences. Uncertainty quantification frameworks are needed both to prioritize climate modeling research and to guide the interpretation of climate model results. A strong verification and validation (V&V) component is also essential for these efforts and therefore proposers should discuss their V&V plans in sufficient detail.
- **A plan to coordinate with and leverage from SciDAC Institutes.** Proposers should detail their plans for establishing partnerships with the SciDAC Institutes (<http://science.energy.gov/ascr/research/scidac/scidac-institutes/>), described below, in order to systematically address the applied math and computer science challenges that are inherent to the scale of new architectures or common across applications. In addition, proposers should detail their plans to establish partnerships maximizing synergy and leverage with other BER supported efforts, for example as described within <http://science.energy.gov/ber/research/cesd/>. Proposers must be explicit about the benefits that they expect to receive from Institutes or other Program Elements. In particular, the lead proposal must include a table in the Statement of Work that explains the tasks to be executed by the various collaborators and the support (whether from BER or ASCR) for those tasks. Reviewers will examine (see Merit Review below) the collaborations for, among others, duplication of effort. The proposal may include coverage of non-duplicative Applied Math/Computer Science expertise to supplement topics for which resources are provided by the Institutes, as well as expertise in topics for which no resources were provided by the Institutes.

- **A plan to utilize and develop community models** such as the Community Earth System Model.

To ensure that CESD modeling research meets both the broad needs of the climate modeling research community and the specific needs of the CESD, successful investigators will participate in the annual science team meeting. Costs for participation in Science Team annual meetings and workshops should be included in each proposal. Yearly estimates for Science Team travel should be based on one trip of five days to Washington, DC.

ASCR and SciDAC Program Objectives

The SciDAC program accelerates progress in computational science by breaking down the barriers between disciplines and fostering productive partnerships between domain scientists and computational scientists (e.g., applied mathematicians, computer scientists) who are capable of exploiting the capabilities of leadership class computational systems (i.e. those existing at or planned in the next five years for the Oak Ridge and Argonne Leadership Computing Facilities, or the high performance production computational systems at the National Energy Research Scientific Computing Center, or similar computing facilities). These partnerships enable scientists to conduct complex scientific and engineering computations at a level of fidelity needed to simulate real-world conditions. In particular, the key components of SciDAC are SciDAC Institutes and SciDAC Partnerships; the latter is addressed in this Announcement.

The Institutes will be the 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. The Institutes are responsible for developing new methods, algorithms and libraries spanning a wide range of SciDAC applications. The recently awarded SciDAC Institutes are as follows:

- **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, particle methods, linear and nonlinear solvers, time integration, eigensolvers, and differential variational inequalities.
- **SUPER:** Sustained Performance, Energy and Resilience (Director: Robert Lucas, University of Southern California). Topics covered include performance engineering (including modeling and autotuning), energy efficiency, resilience, and optimization.
- **QUEST:** Quantification of Uncertainty in Extreme Scale Computations (Director: Habib Najm, Sandia National Laboratories). Topics covered include inverse problems, reduced stochastic representations, forward uncertainty propagation, fault tolerance, and experimental design and model validation.

A successful Partnership will:

1. Exploit leadership class computing resources to advance scientific frontiers in an area of strategic importance to the Office of Science, 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.

Although not required, it is expected that all Partnerships funded under this Announcement, will request, and will receive funds from both BER and ASCR to meet proposed objectives.

Reviewers of proposals submitted to this Announcement will be asked to comment upon the feasibility, benefits, and management of the proposed collaborations between the climate modeling scientists supported by BER on the one hand, and the computational scientists (i.e., applied mathematicians and computer scientists/engineers) supported by ASCR on the other.

The allocation of computing resources available to individual projects will not be part of this Announcement but will be contingent on review and award through the process as described at <http://science.energy.gov/ascr/facilities/allocation-policy/>. Within the available computational resources, every effort will be made to ensure that successful proposals will have the resources needed to support their efforts.

Management structure. The proposers must identify a management structure that enables an effective collaboration between the BER-supported scientists and the ASCR-supported applied mathematicians and computer scientists/engineers. The structure and management must be sufficiently flexible to adapt quickly to changing technical challenges and scientific needs. To that end, the proposers must identify a Director, Science Team Leads, and Laboratory Leads. Projects must identify Science Team Leads for each of their major Science tasks, along with their requested support from BER, and for each of their major Computational Science tasks, along with their requested support from ASCR. Key unfunded personnel should also be mapped into this structure as appropriate. Note that some individuals may have both Science and Computational Science tasks, and some individuals may be assigned to link tasks within or between the climate and computational Science research. Typical duties, responsibilities and authorities for each category are provided below:

- **Director** - The Director is the Lead Principal Investigator and will serve as the primary contact responsible for communications with the DOE Program Officer on behalf of all of the Science Team and Laboratory Leads.
- **Science Team Leads (STLs)** are the individuals with the appropriate level of authority and responsibility for the proper conduct of the research within scientific research areas (such as numerical methods, ocean modeling, atmospheric modeling, etc.). When a project designates more than one Science Team Lead, it identifies them as individuals who share the authority and responsibility for leading and directing the research,

intellectually and logistically. In particular, a responsive proposal would have at a minimum of one STL for Science and one for Computational Science.

- **Laboratory Leads** are the individuals with the appropriate level of authority and responsibility to ensure that laboratory personnel complete required tasks in a timely manner. They are also responsible for ensuring appropriate use of funds and administrative requirements. An individual may serve as both a Laboratory and a Science Team Lead.
- **Senior/Key Personnel** - are individuals who contribute in a substantive, measurable way to the scientific or technical development or execution of the project. This definition includes, but is not limited to, the Director, the STLs and the Laboratory Leads.

The Budget Justification Narrative should clearly map performers/tasks to the appropriate science program (BER or ASCR).

Post-Award process. Upon notification of award, the Director for the successful awardee will be asked to join the Executive Council of the SciDAC Institutes Directors (see DE-FOA-0000505 or LAB 11-505 for a further description of the Executive Council). This group will be chartered to develop and submit (to DOE) an operating plan that will describe the processes, procedures, and metrics to be used for coordination and communication between the Partnership and the Institutes. The operating plan will also include processes for the review and, as appropriate, redirection and reprioritization of tasks within the Partnership. Additional guidance will be provided in the award notification letter.

Eligibility: This Announcement is directed toward DOE National Laboratories. Synergistic collaborations with researchers in other institutions including universities, industry, non-profit organizations, non-DOE Federal Agencies or Federally Funded Research and Development Centers (FFRDCs) are permitted but must be allotted less than 20% of the total project budget.

Collaboratives:

- Each university, industrial organization, and non-profit organization involved in a proposed collaborative research project must submit a separate application to the corresponding Funding Opportunity Announcement DE-FOA-0000588.
- Each laboratory must submit a peer-reviewable field work proposal (as described below) in PDF format to BER. Each application or Field Work Proposal (FWP) must include a common technical description of the overall research activity.
- The research activity should be given one common title and that title should be used by all submitting institutions.
- The narrative of these proposals needs to be the same and should include a summary of the main contributions from each of the collaborating institutions.
- However, the respective proposals should have their own budget and budget justification. **The Lead PI for the collaborative project should include in the appendix the budgets and budget justifications for all the collaborators** as well as a summary table with total budgets for each collaborator.
- In addition to the common technical description of the overall project, each FWP must include a separate FWP Format Cover Page (Reference DOE Order 5700.7C), Budget Page (DOE F 4620.1).

- Each proposal must also contain an appendix with a 1-2 page summary of the tasks and milestones to be completed by the institution submitting the proposal. The description of these tasks and milestones must be sufficiently clear that it is obvious how they relate to the common technical description of the overall research project.

The Lead Laboratory must separately submit a complete proposal in a single PDF file that identifies and contains the common technical description of the overall project and a summary budget for the entire project, including the annual funding proposed for each institution. In addition, this proposal must contain the Cover Pages and Budget Pages for each institution involved in the project. The cover page and budget pages for the lead institution should be included in the front of the proposal, and the cover pages and budget pages of the other institutions should be included in the first appendix. Finally, this complete proposal must include a 1-2 page summary of the tasks and milestones for each collaborating institution in the second appendix.

DATA SHARING POLICY:

Research data obtained through public funding are a public trust. As such, these data must be publicly accessible. To be in compliance with the data policy of the U.S. Global Change Research Program of full and open access to global change research data, proposals submitted in response to this Announcement must include a description of the proposer's data sharing plans if the proposed research involves the acquisition of data in the course of the research that would be of use to the climate change research and assessment communities. This includes data from extensive, long-term observations and experiments and from long-term model simulations of climate that would be costly to duplicate. The description must include plans for sharing the data that are to be acquired in the course of the proposed research, particularly how the acquired data will be preserved, documented, and quality assured, and where they will be archived for access by others. Data of potentially broad use in climate change research and assessments should be archived, when possible, in data repositories for subsequent dissemination. Examples of DOE-funded data repositories may be found at <http://pcmdi3.llnl.gov/>, <http://esg2-gw.ccs.ornl.gov/esgcet/home.htm> and <http://esgf.org>. The repository where the applicant intends to archive the data should be notified in advance of the intention, contingent on a successful outcome of the proposal review. If data are to be archived at the proposer's home institution or in some other location, the proposal must describe how, where, and for how long the data will be documented and archived for access by others. Proposers are allowed an initial period of exclusive use of the acquired data to quality assure it and to publish papers based on the data, but they are strongly encouraged to make the data openly available as soon as possible after this period. DOE's Office of Biological and Environmental Research defines the exclusive use period to be one year after the end of the data acquisition period for the proposed performance period of the award but exceptions to extend this period may be justified for unique or extenuating circumstances.

Program Funding:

It is anticipated that up to \$6.5M will be available for 2-5 awards to be made in Fiscal Year 2012 contingent on the availability of appropriated funds. Awards are expected to be made for a period of five years at a funding level appropriate for the proposed scope, with out-year support contingent on the availability of appropriated funds and satisfactory progress. Funding for the final two years is contingent upon satisfactory completion of a progress review during the third year of each project. DOE is under no obligation to pay for any costs associated with preparation or submission of proposals. DOE reserves the right to fund in whole or part, any, all or none of the proposals submitted to this Announcement.

The instructions and format described below should be followed. You must reference Program Announcement LAB 11-588 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. How would the proposed research lead to significant improvements in capability to accurately or efficiently simulate the climate system?
- b. What current bottlenecks in climate modeling research or predictability are targeted by the proposed project?
- c. What key uncertainties in understanding of the climate system are targeted by the project?
- d. Is it likely that the proposed research will accelerate scientific discovery through leadership class computation?
- e. What science will become feasible with this collaboration that is not feasible now?
- f. Does the project demonstrate a functional partnership among the indicated science application scientists, applied mathematicians, and computational scientists? Does the research plan contain appropriate performance metrics that will allow progress and contributions to be measured?

2. Appropriateness of the Proposed Method or Approach

- a. Does the proposed research include a plan to characterize climate model uncertainty and a plan for validation and verification?
- b. Does the proposed research employ or lead to state-of-the-art approaches that effectively employ leadership-scale computing resources available to DOE researchers?
- c. Does the proposed research exploit existing resources and contribute new resources (e.g., algorithms, software) or would it result in a duplication of existing resources?

3. Competency of Applicant's Personnel and Adequacy of Proposed Resources

- a. Does the proposer have a proven record of success in managing diverse teams of scientific and technical experts and delivering results for advanced computational science research?
- b. Has the proposer identified a credible and fruitful collaboration between climate scientists and computational scientists?
- c. Are any of the computational scientists identified in the proposal also engaged in work for the SciDAC Institutes? For those who are not in the Institutes, is their work duplicative of work going on in the Institutes?
- d. Are the roles and intellectual contributions of the Director and the BER/ASCR Principal Investigators and each senior/key personnel adequately described?

4. Reasonableness and Appropriateness of the Proposed Budget

- a. Is the proposer's requested budget appropriate?
- b. Does the requested budget support the proposer's specified management structure in a meaningful way?

The evaluation process will include program policy factors such as the relevance of the proposed research to the terms of the 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 – 26-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 LAB 11-588. Full proposals submitted in response to this Announcement must be submitted to the searchable FWP database no later than 11:59 pm, Eastern Time, **December 5, 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: Scientific Computation Application Partnerships in Earth System Science (LAB 11-588)**

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. Letters of endorsement from unfunded collaborators should also be included, if applicable. 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 and Recent Accomplishments

- Background – explanation of the importance and relevance of the proposed work.
- Recent Accomplishments – this subsection is mandatory for renewal proposals and should summarize the proposed work and the actual progress made during the previous funding period.

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 you are submitting as a Lead Laboratory, in addition to meeting all criteria for submitting a peer reviewable proposal, the Lead Proposal must contain an additional page with a budget table (see example below) that shows the requested annual budgets for each collaborating institution and an explanation (with another, e.g., chart, table) of which tasks will expect BER support and which tasks will expect ASCR support (some tasks may require both BER and ASCR support). 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.

Partnership	Year 1	Year 2	Year 3	Year 4	Year 5	Total
(Start by Lead Institution) Name of the Institution and the Principal Investigator	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)
Name of the Institution and the Principal Investigator	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)
Name of the Institution and the Principal Investigator	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)
Total	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)	\$(BER)/\$(ASCR)

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; and letters from investigators at other institutions stating their agreement to participate in the project (do not include letters of endorsement of the project).

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.