

Program Announcement To DOE National Laboratories

LAB 12-714

Office of Science Office of Fusion Energy Sciences

Collaborative Research in Magnetic Fusion Energy Sciences on International Research Facilities

**GENERAL INQUIRIES ABOUT THIS PROGRAM ANNOUNCEMENT TO DOE
NATIONAL LABORATORIES SHOULD BE DIRECTED TO:**

Technical/Scientific Program Contact:

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SUMMARY:

The Office of Fusion Energy Sciences (FES) of the Office of Science (SC), U.S. Department of Energy (DOE), hereby announces its interest in receiving proposals from multi-institutional teams to carry out experimental research in magnetic fusion energy sciences on international tokamak facilities. The FES International Collaboration portfolio supports U.S. scientific teams who work in collaboration with foreign scientists to explore critical science and technology issues at the frontiers of magnetic fusion research. These collaborations take advantage of the unique capabilities of the most advanced international research facilities. The Fusion Energy Sciences Advisory Committee (FESAC) International Collaboration Panel recently submitted a report entitled “International Collaboration in Fusion Energy Sciences Research: Opportunities and Modes during the ITER Era” on compelling opportunities for international collaboration: http://science.energy.gov/~media/fes/pdf/workshop-reports/20120309/FESAC-Intl_Collaborations-final-report.pdf

The specific areas of interest for this Program Announcement involve one of the major scientific challenges identified in this report: achieving high performance core plasma regimes suitable for long pulse. Specific topical areas of interest include:

1. Exploring and understanding the transport properties of high performance tokamak plasmas, including the dynamics of the current profile evolution consistent with transport behavior;
2. Studying and developing integrated control schemes capable of maintaining high performance plasmas at the desired operating point for long periods of time;
3. Establishing the physics and engineering of auxiliary systems that provide the means of controlling plasmas for long periods of time;
4. Understanding processes that couple the plasma to the material walls and exploring integrated solutions for the plasma material interface compatible with high performance core plasmas; and
5. Investigating and understanding the physics of transient events such as disruptions to ensure that they can be reliably avoided and developing mitigation techniques as a backup.

To be considered for funding, applicants must have discussed their proposed research with the program leaders and key scientific collaborators at the international facility or facilities where they propose to carry out collaborative research and must provide a letter of support for the proposed collaborative research from a program leader at each facility.

More specific information on each area of interest is included in the Description of Topical Areas section under SUPPLEMENTARY INFORMATION below.

A companion Funding Opportunity Announcement (DE-FOA-0000714) will be posted on the SC Grants and Contracts web site at: <http://www.science.doe.gov/grants>

PRE-PROPOSAL: (Required)

Pre-proposals are **REQUIRED** and must be submitted by May 14, 2012, 11:59 PM Eastern Time. **Failure to submit a pre-proposal by a proposer will preclude the full proposal from due consideration.** The pre-proposal should be submitted electronically by E-mail to Steve.Eckstrand@science.doe.gov and John.Sauter@science.doe.gov. **Please include "Pre-proposal for Program Announcement LAB 12-714" in the subject line.** Responses to the pre-proposals encouraging or discouraging formal proposals will be communicated to the proposers by May 21, 2012. Proposers who have not received a response regarding the status of their pre-proposal by this date are responsible for contacting one of the above listed individuals to confirm this status.

The pre-proposal should include cover page information, a brief description of the proposed work (1-2 pages, including text with minimum font size 11 point, figures, and references), and a one-page curriculum vitae for each Principal Investigator (PI), co-Principal Investigator (co-PI), and senior researcher or consultant. The cover page should include: (a) A statement that the document is a pre-proposal in response to Program Announcement LAB 12-714; (b) Lead PI information: name, institutional affiliation, telephone number, fax number, and e-mail address; and, (c) names and institutions of all Institutional PIs, and senior researchers or consultants (excluding postdoctoral associates and graduate students). Since one of the purposes of the pre-

proposal is to facilitate FES in planning the merit review and the selection of peer-reviewers without conflicts of interest, it is important that applicants ensure their list of supported or unsupported participants is as comprehensive as possible.

Pre-proposals will be reviewed by FES program officials for responsiveness to this Program Announcement, eligibility of the applicant organization, and qualification of the applicant's personnel for carrying out international research activities. Only those applicants who receive notification from DOE encouraging a full proposal may submit a formal proposal.

No other formal proposals will be considered.

PROPOSAL DUE DATE:

Formal proposals submitted in response to this Program Announcement must be submitted from the DOE National Laboratory to the site office through Searchable FWP by **Thursday, June 21, 2012, 11:59 p.m. Eastern Time**, to be accepted for merit review and to permit timely consideration for award in Fiscal Year 2013. **Each proposal should be in a single PDF file. The first few pages of the PDF should be the Field Work Proposal (FWP) 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 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 12-714.

SUPPLEMENTARY INFORMATION:

The mission of the Fusion Energy Sciences (FES) program is to expand the fundamental understanding of matter at very high temperatures and densities and to build the scientific foundation needed to develop a fusion energy source. As a major step toward realizing this mission, the U.S. is a partner in an international project to build and operate ITER, the world's largest scientific facility, to demonstrate the scientific and technological feasibility of fusion energy. ITER is currently under construction in Cadarache, France and is scheduled to begin operation around 2020. Looking toward the ITER era, a major goal of the FES program is develop the scientific work force needed to be a leader in burning plasma science so that the U.S. can contribute to and benefit from participation in the next generation of fusion research facilities, including ITER. While ITER is under construction, the FES program intends to make effective use of limited resources to explore critical issues at the frontiers of fusion research with a balanced program that exploits both the strength of its domestic research program and new capabilities that are becoming available on foreign fusion facilities.

One of the major scientific challenges that must be addressed on the path to fusion energy is: achieving high performance core plasma regimes suitable for long pulse.

Description of Topical Areas

The specific areas of interest for this Program Announcement involve extending high performance regimes to long pulse and are the following:

1. Transport

The focus of this topical area is research on the transport of energy, particles and momentum in high performance tokamak plasmas. Understanding the dependence of transport on dimensionless parameters has proven to be a valuable tool in making extrapolations to future devices such as ITER. Multi-device studies of the normalized gyroradius (ρ^*) and collisionality (ν^*) dependences are needed to reduce the uncertainties in projections to future devices. In a very long-pulse tokamak, the plasma current must be sustained non-inductively by a combination of neutral beam or radio-frequency current drive and the pressure gradient-driven bootstrap current. Since the pressure gradient depends on transport processes, it is also important to understand the interaction between the transport processes in the plasma and the current profile evolution.

2. Long Pulse Control

The focus of this topical area is research on integrated control schemes capable of maintaining high performance plasmas at the desired operating point for long periods of time. This involves operating near stability limits for pulse lengths much longer than have been achieved in current tokamaks and non-inductive sustainment of the plasma current. In a high beta plasma with high bootstrap fraction, the transport of energy, particles, momentum, and current become strongly interdependent. Further, the plasma stability is governed largely by the plasma pressure profile and the current density profile, which evolve on the transport time scale and the current redistribution time scale respectively. A key challenge is developing control schemes to maintain plasmas within stable operational boundaries and actively manage deleterious events such as tearing modes, ELMs and disruptions. This requires exploration of the operational limits to identify and optimize these limits, as well as the development and optimization of specific control tools such as 3-D field coils or localized current drive systems. An area of mutual benefit is to develop a range of techniques for stability control, ELM control or amelioration and disruption avoidance or mitigation in flexible U.S. facilities and then to participate in the extension of these techniques to long pulse in superconducting devices (where rapid change in some parameters is precluded).

3. Plasma Wall Interaction

The focus of this topical area is research on the processes that couple the plasma to the material walls and exploring integrated solutions for the plasma material interface that are compatible with high performance core plasmas. The materials for the plasma facing components in a fusion device must withstand high thermal power fluxes, retain a small fraction of incident fuel particles and maintain structural strength under intense neutron irradiation. One major concern is the long term survivability of plasma facing components due to materials degradation, erosion and migration. To date, power densities approaching those of a fusion power plant have been attained

for only a few seconds. Moreover, these experiments used plasma facing materials not suitable for a fusion environment involving tritium fuel and intense neutron irradiation. The U.S. can develop candidate materials domestically, and assess them in test bed and tokamak facilities, though likely not to full thermal equilibrium. Furthermore, many facets of the structural evolution of materials under plasma exposure develop on a longer timescale. Important issues for collaborative research include: material erosion, migration and re-deposition, surface morphology evolution, material migration, and in-vessel inventory control of hydrogenic isotopes including co-deposition and permeation processes. A major opportunity is collaboration on plasma wall experiments using fusion relevant materials such as tungsten under the high temperature conditions $> 500^{\circ}\text{C}$ required for an efficient fusion power system.

4. Magnetic Divertor Optimization

Most designs for future fusion devices retain a magnetic divertor to channel the particles and heat away from the core plasma to a region where they can more easily be extracted. However, as average heat loads increase, better materials alone will not be sufficient to handle the heat flux. The heat flux depends on the scaling of the scrape-off-layer (SOL) profiles and parallel heat fluxes. Research is needed to better understand the physics of the SOL and to develop new divertor configurations that spread the heat flux over a wider area without affecting the performance of the plasma core. There may be opportunities to extend new divertor configurations that are being studied current copper coil devices to new superconducting facilities.

5. Auxiliary Systems

The focus of this topical area is research on the physics and engineering of auxiliary systems that provide the means of controlling plasmas for long periods of time. In order to achieve and sustain high performance plasmas, systems that can heat and fuel the plasma, drive plasma current, handle the exhaust of heat and particles from the plasma, and modify the profiles of current density and pressure need to be developed or extended to meet the requirements of long-pulse to steady-state operation. An opportunity for mutual benefit is participation in the design and operation of such systems on large, superconducting tokamaks.

These research areas are interconnected, and success in developing fusion power requires that all of them be integrated in robust operating scenarios. Thus, proposed research may focus on one research area or a combination of areas. In addition, the proposed research may involve collaborations with one or more than one foreign facility.

Additional Considerations

All proposals submitted in response to this Program Announcement should be for topical teams that propose a coordinated US program of research on one or more foreign facilities. The decision on whether to focus on one or more than one foreign facility should be based on the specific research program being proposed. Topical teams involving scientists from national laboratories, universities, and/or industry are encouraged.

Management structure

It is expected that all proposals submitted in response to this Program Announcement will be for topical teams involving scientists from national laboratories, universities, and/or industry. The applicants must propose and describe a management structure that enables an effective collaboration among the participants from various disciplines and institutions. The structure and management must be sufficiently flexible to adapt quickly to changing technical challenges and scientific needs. To that end, applicants must identify a Lead Principal Investigator, Principal Investigator(s) for each of the other institutions involved, and Senior/Key Personnel. Furthermore, they should specify the requested level of support from FES for each task. Typical duties, responsibilities and authorities for each category are provided below:

- **Lead Principal Investigator** - The Lead Principal Investigator must be employed by the Lead institution and will serve as the primary contact responsible for communications with DOE Program Officials on behalf of all of the Principal Investigators in the team.
- **Principal Investigator** - A Principal Investigator (PI) is the individual designated by each collaborating institution 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.
- **Senior/Key Personnel** - A senior/key person is an individual who contributes in a substantive, measurable way to the scientific or technical development or execution of the project.

Additional Guidance to Applicants

Proposals must be formulated as three-year projects with specific goals and deliverables that demonstrate the scientific merit and impact of the proposed research.

Additional Resources

1. Magnetic Fusion Energy Sciences Research Needs Workshop (ReNeW) report, June 2009, http://science.energy.gov/~media/fes/pdf/workshop-reports/Res_needs_mag_fusion_report_june_2009.pdf
2. FESAC Report on Priorities, Gaps and Opportunities: Towards a Long-Range Strategic Plan for Magnetic Fusion Energy, October 2007, http://science.energy.gov/~media/fes/fesac/pdf/2007/Fesac_planning_report.pdf

Collaboration

Since this program announcement involves research collaborations on one or more foreign research facilities, all proposers must discuss their proposed research with the program leaders and key scientific collaborators at each of the international facilities where they propose to collaborate and provide a letter of support for the proposed collaboration from a program leader at each facility.

Collaborative proposals submitted from different institutions should clearly indicate they are part of a topical project/team. Every partner institution must submit a proposal through its own business office. Each proposal within the topical team, including the narrative and all required appendices and attachments, should be identical with one exception: each proposal should contain unique budget and budget justification documents corresponding to the expenditures for that application's submitting institution only. Each topical team can have only one lead institution, which should be identified in the common narrative. The common narrative should also contain a summary table listing the institutions involved, the PI for each institution, and a budget breakdown by institution for all participants.

Each proposal belonging to a topical team should have the same title. Our intent is to create from the various proposals associated with a topical team one document for merit review that consists of the common, identical required appendices and attachments combined with a set of detailed budgets from the partner institutions. Thus, it is very important that every proposal in the topical team be exactly identical (including the title) with the exception of the budget, budget justification, and individual scope of work pages.

Program Funding:

It is anticipated that up to \$6,000,000 per year will be available for two to three topical teams. Thus, it is anticipated that up to six awards may be made in FY 2013, contingent on the availability of appropriated funds. This amount is the total available funding for both the Program Announcement and the associated FOA. Awards 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. Funding for the final year is contingent upon satisfactory completion of a progress review during the second year of each project.

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. FES reserves the right to make fewer awards than would be possible at \$6,000,000 per year, if an insufficient number of proposals are judged to be of suitable scientific quality or of sufficient relevance to the programs.

The instructions and format described below should be followed. You must reference Program Announcement LAB 12-714 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 (FWP) 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:

a) Scientific and/or Technical Merit of the Project

- *What is the potential impact of proposed research on the feasibility of fusion energy and what is the urgency of carrying out this research?*
- *How significant and distinctive would the US contribution be?*
- *Does the proposed research have a positive synergy with US domestic research programs?*
- *Would the proposed research program strengthen and extend the US scientific workforce in areas needed to carry out the US fusion program in the longer term?*

b) Appropriateness of the Proposed Method or Approach

- *Is the conceptual framework of the proposed research adequately developed and appropriate?*
- *Does the proposed research effectively exploit US scientific strengths?*
- *Are there significant potential problems in the proposed method or approach? If so, are the applicant's plans to address these problems—including the consideration of alternative strategies—adequate?*

c) Competency of Applicant's Personnel and Adequacy of Proposed Resources

- *Has the applicant identified a credible and cost-effective collaboration between US scientists and foreign scientists?*
- *Have the resources needed from the host facility been clearly identified?*
- *Do the Lead Principal Investigator and other Principal Investigators have proven records of success in managing diverse teams of scientific and technical experts and delivering results?*
- *Are the roles and intellectual contributions of the Lead Principal Investigator, the other Principal Investigators and senior/key personnel adequately described and supported?*

d) Reasonableness and Appropriateness of the Proposed Budget

- *Is the applicant's requested budget appropriate?*

- *Does the requested budget support the applicant's specified management structure?*

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, such as developing a scientific workforce capable of scientific leadership in the ITER era. 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 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 12-714. 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, **June 21, 2012**. 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 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: **Collaborative Research in Magnetic Fusion Energy Sciences on International Research Facilities - LAB 12-714**

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 as part of the proposal submission. You may find the appropriate budget forms (OMB approved Research & Related Budget Form No. 4040-0001) to use at the SC web site: <http://www.science.doe.gov/grants/BudgetForm.pdf>. A budget form is required for each year of funding requested. A cumulative budget page covering the entire period of support being requested is also required and is available as part of the budget form package. 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.

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.

Please submit letters of support only from the foreign facility program managers and from unfunded collaborators whose work is important to the research project, 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.

Proposed Research and Tasks

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

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: <http://www.science.doe.gov/grants/BudgetForm.pdf>

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.