Program Announcement
To DOE National Laboratories

LAB 12-02

Office of Science

Office of Fusion Energy Sciences

High Energy Density Laboratory Plasma Science for Inertial Fusion Energy

GENERAL INQUIRES ABOUT THIS PROGRAM ANNOUNCEMENT SHOULD BE DIRECTED TO:

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SUMMARY:

The Office of Fusion Energy Sciences (OFES) program of the Office of Science (SC), U.S. Department of Energy (DOE), announces its interest in receiving proposals for new awards for research in High Energy Density Laboratory Plasma (HEDLP) Science for Inertial Fusion Energy (IFE). Proposals are sought for coordinated, multi-institutional, research teams which will address questions identified to be of critical importance to inertial fusion energy science development. Each submitting institution is limited to a maximum of 6 lead proposals.

HEDLP physics is the study of ionized matter at extremely high density and temperature, specifically when matter is heated and compressed to a point that the stored energy in the matter reaches approximately 100 billion Joules per cubic meter (the energy density of a hydrogen molecule). This corresponds to a pressure of approximately 1 million atmospheres or 1 Mbar. Systems in which free electrons play a significant role in the dynamics and for which the

underlying assumptions and methods of traditional ideal-plasma theory and standard condensed matter theory do not apply (e.g., Warm Dense Matter (WDM) at temperatures of a few eV) can have pressures as low as 0.1 Mbar and are also considered high-energy-density plasmas.

Research in HEDLP forms the scientific foundation for developing scenarios that could facilitate the transition from laboratory inertial confinement fusion experiments to inertial fusion energy. The OFES is seeking proposals that address the findings and recommendations of the 2009 Fusion Energy Sciences Advisory Committee report on *Advancing the Science of High Energy Density Laboratory Plasmas*, with specific regard to HEDLP Science for IFE. Proposing collaborative research teams should include an integration of experimental, theoretical, and computational science. Specifically, proposals are sought for short-term (~3 years) activities which address the highest-priority questions, identified to be of critical importance, to inertial fusion energy science development, namely:

1. Transport and energy coupling of intense particle beams in high energy density plasmas
2. Intense particle-beam generation by ultra-intense lasers
3. Influence of magnetic fields on high energy density fusion plasmas
4. Integrated target physics for inertial fusion energy

More specific information on each area of interest is outlined in the general and program-specific **SUPPLEMENTARY INFORMATION** section provided below.

References

Fusion Energy Sciences Advisory Committee report on Advancing the Science of High Energy Density Laboratory Plasmas, Chair: Riccardo Betti
(http://science.energy.gov/~/media/fes/fesac/pdf/2009/Fesac_hed_lp_report.pdf)

PRE-PROPOSAL: (Required)

Pre-proposals are **REQUIRED - Failure to submit a pre-proposal will preclude the full proposal from due consideration**. Pre-proposals must be submitted by **July 30, 2012, 11:59 PM Eastern Daylight Time. A single pre-proposal is expected to represent each collaborative research team.** Each institution is limited to a maximum of 6 lead proposals. 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 the proposed research activities. Only those applicants of a collaborative research team who receive notification from DOE encouraging a full proposal may submit a formal proposal. **No other formal proposals will be considered.**

Responses to the pre-proposals encouraging or discouraging formal proposals will be communicated to the proposers by August 10, 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.

Pre-proposals should be submitted electronically by E-mail to both Sean.Finnegan@science.doe.gov and John.Sauter@science.doe.gov. Pre-proposals must include**:**

Email Subject Line: "Pre-proposal for Program Announcement LAB 12-02"

Cover Page

(a) A statement that the document is a pre-proposal in response to Program Announcement LAB 12-02;

(b) Lead PI information: name, institutional affiliation, telephone number, fax number, and e-mail address;

(c) Collaborative PI information - for each Laboratory in the collaboration which will submit a linked proposal (not universities which should be subcontracts): name, institutional affiliation, telephone number, fax number, and e-mail address;

(d) Names and institutions of all Senior/Key personnel or consultants (Since one of the purposes of the pre-proposal is to facilitate OFES 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.).

Project Description

A brief description of the importance and relevance of the proposed work, scientific objectives and hypotheses to be tested (if any), as well as methods to be used. Maximum 2 pages, including text (with minimum font size 11 point), figures, and references.

Curriculum Vitae

No more than one page for each Lead/Collaborative Principal Investigator (PI) and Senior/Key researcher or consultant.

PROPOSAL DUE DATE: **October 1, 2012, 11:59 p.m. Eastern Daylight Time**

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 **Monday, October 1, 2012, 11:59 p.m. Eastern Daylight 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. 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**.

IMPORTANT SUBMISSION INFORMATION:

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 12-02.

SUPPLEMENTARY INFORMATION:

Proposed collaborative team research efforts should include an integration of experimental, theoretical, and computational science. Specifically, proposals are sought for short-term (~3 years) activities which address the highest-priority questions, identified to be of critical importance, to inertial fusion energy science development, with additional scope indicated specifically below.

1. Transport and energy coupling of intense particle beams in high energy density plasmas

Specific areas of interest include, but are not limited to, coupling of laser-produced energetic particles with the dense core of imploded targets; electron and ion stopping rates in warm and hot dense matter; longitudinal compression and transverse focusing of intense ion beams within background plasma; nonlinear ion-beam dynamics; collective beam plasma interactions.

2. Intense particle-beam generation by ultra-intense lasers

Specific areas of interest include, but are not limited to, the effects of pre-plasma (generated by the laser pre-pulse) on particle energy spectrum; maximization of laser-particle conversion efficiency while maintaining particle energy and angular distribution that can be optimally transported to the compressed target; assessment and control of the angular spread of energetic particles accelerated by intense lasers; assessment of the energy and power requirements to successfully form a plasma-free channel in the underdense region and bore a hole inside the critical surface.

3. Influence of magnetic fields on high energy density fusion plasmas

Specific areas of interest include, but are not limited to, the origin and effects of self generated magnetic fields in the coronal, conduction zone plasma of laser driven implosions and in fast–ignition cone implosions; the effects on implosion performance of thermal transport inhibition induced by magnetic fields; effects of capsule geometry and seed-field strength on alpha particle transport and energy deposition in magnetized hot-spot inertial confinement fusion implosions; effects of plasma liner mix on implosion performance of imploding cylindrical liners.

4. Integrated target physics for inertial fusion energy

Specific areas of interest include, but are not limited to, optimization studies to identify: a point design for magneto-inertial-fusion integrated experiments with imploding metal liners, heavy-ion direct-drive IFE targets, laser-driven IFE targets, z-pinch IFE targets, fast ignition IFE targets, and shock-ignition IFE targets.

Additional Considerations

In selecting proposals for funding, priority will be given to proposals that can produce experimental results within three years after project initiation.

Management Structure

It is expected that **all** proposals submitted in response to this Program Announcement will be for a Laboratory led research team involving scientists from national laboratories, universities, and/or industry. Therefore the proposal must describe a management structure that enables an effective collaboration among the participants from various disciplines and institutions to achieve the scientific objectives proposed. 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, Collaborative Principal Investigator(s) for each of the other institutions involved, and Senior/Key Personnel. Furthermore, they should specify the requested level of support from OFES for each task. Participation of non-lab collaborative parties should be through sub-award from the Lead PI. 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.
- **Collaborative Principal Investigator -** A Collaborative Principal Investigator 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.

Research Team Size

Research teams should consist of between 5 and 10 investigators (not to exceed 15) including the Lead Principal Investigator, Collaborative Principal Investigator(s), and Senior/Key Personnel.

Collaboration

It is expected that **all** proposals submitted in response to this Program Announcement will be for a Laboratory led research team involving scientists from national laboratories, universities, and/or industry. Each research team can have only one lead institution, which should be identified in the management plan. Participation of non-lab collaborative parties should be through sub-award from the identified Lead PI of the proposed team. Participation of additional DOE laboratory partners will require a separate proposal; however this proposal should clearly indicate they are part of a research team/project. The title of a Lead proposal **must include the project title with the addition of "LEAD" at the end.** The title of a collaborative team member proposal **must be identical to the title of the lead proposal with the addition of "COLLABORATION" at the end.** Each proposal within the research team must contain an **identical common narrative** which includes: the technical proposal, all required appendices and attachments, management plan, summary table listing the institutions and PIs involved, and a budget breakdown by institution for all participants. Each collaborative proposal of a team should contain the **unique budget and budget justification documents** corresponding to the expenditures for that collaborative proposal's submitting institution only.

Important for proper review: Each proposal belonging to a collaborative research team **must** have appropriate corresponding titles. Our intent is to create from the various proposals associated with a research team one document for merit review that consists of the common, identical general proposal, 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 $5,000,000 per year will be available for up to five research teams. Award sizes will range from $1,000,000 per year to $2,000,000 per year, contingent on the availability of appropriated funds.

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. Programmatic relevance is a factor in evaluating all proposals.

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. OFES 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.

Type of Proposal

DOE will accept only new proposals under this Program Announcement.

Eligibility

This is a DOE Lab-only Announcement. FFRDCs from other federal agencies are not eligible to submit in response to this Program Announcement. Each laboratory is limited to a maximum of 6 lead proposals.

The instructions and format described below should be followed. You must reference Program Announcement LAB 12-02 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 the proposed research on advancing/assessing the feasibility of inertial fusion energy and what is the urgency of carrying out this research?*
- *How does the proposed research compare with other related research, both in terms of scientific and/or technical merit and originality?*
- *What is the likelihood that it will lead to new or fundamental advances?*

b) Appropriateness of the Proposed Method or Approach

- *Is the conceptual framework of the proposed research adequately developed and likely to lead to scientifically valid conclusions?*

- *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 Proposer's Personnel and Adequacy of Proposed Resources; and

- *Has the applicant identified a credible and cost-effective collaboration?*
- *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, both for the entire collaboration and each component appropriate?*
- *Does the requested budget support the applicant's specified management structure?*

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.

The evaluation process will also include program policy factors such as the relevance of the proposed research to the terms of the Announcement and the agency's programmatic needs. In selecting proposals for funding, priority will be given to proposals that can produce experimental results within three years after project initiation.

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, management plan 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 12-02. 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, **October 1, 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

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: **High Energy Density Laboratory Plasma Science for Inertial Fusion Energy - LAB 12-02**
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.

* Form 4620.1 is available at web site: http://www.science.doe.gov/grants/BudgetForm4620.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

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. The proposal narrative must include and be separated into the following sections

a) **Background/Introduction**: Explanation of the importance and relevance of the proposed work as well as a review of the relevant literature.

b) **Proposed Research and Methods**: Identify the hypotheses to be tested (if any) and details of the methods to be used including the integration of experiments with theoretical and computational research efforts.

c) **Timetable of Activities**: Timeline for all major activities including milestones and deliverables.

d) **Management Plan and Responsibilities of Key Project Personnel**: Indicate which project personnel will be responsible for which research activities.

These sections are to be clearly labeled and listed in the table of contents. 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.

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..

Submit letters of support *only* from (1) facility managers verifying facility time awarded and feasibility and status of proposed facility needs, and from (2) unfunded collaborators whose work is important to the research project, if applicable. (**Do not submit general letters of support/endorsement of the project as these are not used in making funding decisions and can interfere with the selection of peer reviewers**)

4. Detailed Instructions for the Budget

http://www.science.doe.gov/grants/BudgetForm4620.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.