

**Program Announcement
To DOE National Laboratories
LAB 06-10**

***Low Dose Radiation Research Program
- Basic Biology***

SUMMARY: The Office of Biological and Environmental Research (BER) of the Office of Science (SC), U.S. Department of Energy (DOE) and the Human Research Program (HRP), National Aeronautics and Space Administration (NASA), hereby announce their interest in receiving proposals for new research to develop a better scientific basis for understanding exposures and risks to humans from low doses or low fluences of ionizing radiation. Research must support the DOE/BER Low Dose Radiation Research Program, and may include complementary research of direct interest to the NASA/HRP Space Radiation Project of sufficient scientific merit to qualify for partial NASA support. To be considered for funding, research must focus on elucidating molecular mechanisms and pathways involved in normal radiobiological responses to low dose exposure; exclusively phenomenological studies will not be considered. New research is especially encouraged that focuses on molecular responses at tissue- and higher levels of biological organization. Scientists working in rapidly developing areas of biological sciences not necessarily associated with the study of radiation are also encouraged to consider the contributions that their field of study can make. High risk research having the potential to rapidly advance the field, and research employing genome-wide or proteome-wide methods, is particularly encouraged.

DOE/BER also announces its interest in receiving proposals for special awards to support new collaborative work between two or more laboratories, one or more of which is already funded by the DOE Low Dose Program. These "glue awards" are primarily designed to support post-doctoral or graduate-student research that will enable laboratories with complementary expertise to develop and apply innovative new approaches to low dose radiation research. **Please review the Supplementary Information sections below for further discussion of programmatic needs, and for details on format for the two types of proposals.**

DATES: Potential researchers are strongly encouraged to submit a brief pre-proposal, referencing Program Announcement LAB 06-10, for receipt by DOE by February 22, 2006. A response to the pre-proposals encouraging or discouraging full proposals will be communicated to the researchers by March 3.

Full proposals submitted in response to this Announcement must be submitted to the DOE Electronic Proposal Management Application (ePMA) system (<https://epma.doe.gov>) no later than 8:00 p.m., Eastern Time, April 26, 2006, to be accepted for merit review and to permit timely consideration for award in Fiscal Year 2007. It is important that the entire peer reviewable proposal be submitted to the ePMA system as single PDF file attachment. Please see the "Addresses" section below for further instructions on the methods of submission for the full proposal.

ADDRESSES: Preproposals referencing Program Announcement LAB 06-10 should be sent as PDF file attachments via e-mail to: SClifesci.lowdose@science.doe.gov with "Lab Notice 06-10" as the subject. No FAX or mail submission of pre-proposals will be accepted.

A complete formal FWP in a single Portable Document Format (PDF) file must be submitted through the DOE ePMA system (<https://epma.doe.gov>) as an attachment. To identify that the FWP is responding to this Program Announcement, please fill in the following fields in the "ePMA Create Proposal Admin Information" screen as shown:

Proposal Short Name:

Fiscal Year:

Proposal Reason:

Program Announcement Number: Lab 06-10 *

Program announcement Title: Low Dose Radiation Research Program - Basic Biology*

Proposal Purpose:

Estimated Proposal Begin Date:

HQ Program Manager Organization:

* Please use the wording shown when filling in these fields to identify that the FWP is responding to this Program Announcement.

A CD and three copies of the proposal would also be appreciated, submitted using the following, by U.S. Postal Service Express Mail, any commercial mail delivery service, or when hand-carried to:

Dr. Noelle F Metting U.S. Department of Energy Office of Biological and Environmental Research, SC-23.1/GTN 19901 Germantown Road Germantown, MD 20874-1290 ATTN: Program Announcement LAB 06-10.

FOR FURTHER INFORMATION CONTACT: Send general questions to SClifesci.lowdose@science.doe.gov. For specific information on DOE interests, contact Dr. Noelle Metting, telephone: (301) 903-8309, E-mail: noelle.metting@science.doe.gov, Office of Biological and Environmental Research, U.S. Department of Energy, SC-23.1/Germantown Building, 1000 Independence Avenue SW, Washington, DC 20585-1290. For specific information on NASA/HRP interests, contact Dr. Francis Cucinotta, telephone (281) 483-0968, E-mail: francis.a.cucinotta@nasa.gov.

SUPPLEMENTARY INFORMATION

- I. Specifics for the Low Dose Radiation Research Program (DOE)
- II. Specifics for Glue Awards (DOE)
- III. Specifics for the Space Radiation Project (NASA)

I. Specifics for the Low Dose Radiation Research Program (DOE)

The DOE/BER Low Dose Radiation Research Program has the challenge of conducting research that can be used to inform the development of future national radiation risk policy for the public and the workplace. The Low Dose Program is chiefly concerned with very low doses of low Linear Energy Transfer (LET) radiation (high energy electrons and protons, x- and gamma-rays). The focus of research should be on doses of low LET radiation that are at or near current workplace exposure limits. In general, research is desired that focuses on total radiation doses that are less than 0.1 Gray (10 rads). Some experiments will likely involve selected exposures to higher doses of radiation for comparisons with previous experiments or for determining the validity of extrapolation methods previously used to estimate the effects of low doses of radiation from observations made at high doses.

Low dose-rate studies are also very desirable. In these studies it is important that the range of total doses delivered also encompass the low dose range, i.e., total doses should adequately cover the range of 0.1 Gy or less in addition to any higher total doses. It is worth noting that experimental delivery of only 0.01 Gy (1 rad) over a period of 24 hours is still an approximately 1000-fold higher dose rate than the average background radiation dose rate in the U.S. It is probable that a normal biological system might have molecular sensors that detect and respond to a 1000-fold change in environmental conditions, and research is sought to elucidate these responses, if they exist.

Until fairly recently, most molecular studies of radiation effects were carried out using isolated cells in monolayer culture, and the responses of those cells were then extrapolated to mammalian tissues and organisms. There is already compelling evidence that molecular endpoint measurements such as gene expression and apoptosis induction can differ significantly in quality and/or quantity as a function of radiation dose, both in whole animal experimental systems and in the more artificial cell culture systems. New research indicates that molecular endpoint measurements are also qualitatively different as a function of the level of biological organization (cells, tissues, or whole organisms), and that normal, intact tissue may respond, in general, very differently to radiation than monoculture/monolayer cell populations. Innovative new research is needed to explore and more fully understand low dose radiation-induced molecular responses, and subsequent health outcomes, at these higher levels of biological organization.

New models for human health risk from low doses of radiation are also needed that incorporate the results of both low dose /dose-rate human epidemiological studies and the newer low dose / dose-rate biological studies.

Not all research on the biological effects of low doses of radiation will be equally useful for the development of radiation risk policy, though the path from basic radiation biology research to radiation risk policy is admittedly not clear at this time. In the present context, the research considered to be most useful will focus on biological outcomes after very low dose exposures and/or very low dose-rate exposures. Rather than just quantifying phenomenological outcomes, the research goal will be to elucidate molecular mechanisms involved. Research should also study responses in cells that reside in intact tissues or whole organisms, rather than experiments entirely in cell culture. Because information on regulatory, metabolic, and signaling pathways is growing rapidly, proposals should point out, wherever possible, how the proposed research might link with, clarify, and/or extend this information. Finally, successful proposals will ideally

have an approach or component (whether experimental or modeling) that could potentially link data from experiment to downstream health outcomes that might occur in humans.

Alternatively, a biological response of interest could meet all of the above criteria only at high doses but may actually be absent (as opposed to simply undetectable) at low doses of radiation. Since evidence is accumulating that the mechanisms of action after high doses of radiation may be different from the mechanisms of action after low doses, such studies would help define these mechanisms. Defining the doses where these mechanisms shift is of critical importance.

The Low Dose Program will be a success if the science it generates is useful to policy makers, standard setters, and the public. Successful applicants will be expected to effectively communicate research results through publication in peer-reviewed journals. Any data and results generated through the investigations that are appropriate to share with the broader scientific community should, where possible, be provided in a format amenable to deposition in databases. Successful applicants will also be encouraged to communicate with the wider community of concerned persons, so that current thinking and public debate are better able to reflect sound science.

The DOE Low Dose Program is already making significant investments and progress in topics such as DNA damage and repair, endogenous oxidative damage versus low dose radiation-induced damage, radio-adaptive responses, bystander effects, genomic instability, and individual genetic susceptibility to low dose radiation exposure. Descriptions of these topics can be found in the open literature via PubMed, <http://www.ncbi.nlm.nih.gov/entrez/query.fcgi>, and on the Program website, <http://lowdose.tricity.wsu.edu/>. Information on current and past Program-funded projects, publications lists, and other information relevant to low dose radiation studies can also be found on the Program website.

The DOE Low Dose Program is currently funding several projects that have developed micro-irradiation devices capable of delivering low doses of low LET radiation to individual cells or to specific parts of individual cells. Investigators are encouraged to use these irradiators, as appropriate, through collaborative means. Information on the microbeam irradiators can be found at: http://lowdose.tricity.wsu.edu/radiobio_techniques.htm.

Several tissue repositories are available for Low Dose Program investigations. The University of Washington has a tissue repository containing cell lines derived from patients who developed second cancers following total body irradiation and hematopoietic stem cell transplantation (HSCT). Presently there are EBV-transformed cell lines from 25 individuals exposed to radiation, which subsequently developed a skin tumor, and an equal number from exposed individuals that have not yet developed a second cancer. Please contact directly Dr. Jeffrey L. Schwartz, Associate Professor of Radiation Oncology, University of Washington, (206) 598-4091, E-mail: jschwart@u.washington.edu, for collaborative opportunities. Other available resource material are fixed animal and human tissue samples from individuals exposed to either external radiation or to internally deposited radioactive materials. For information on these tissue archives, please contact Dr. Gayle Woloschak, Northwestern University (312) 503-4322, g-woloschak@northwestern.edu.

II. Specifics for Glue Awardsts (DOE)

The Low Dose Radiation Research Program is also interested in receiving proposals for the purpose of supporting collaborative work between two laboratories, one of which should be currently funded by the Program. These small awards are primarily designed to support post-doctoral or graduate-student research that will enable laboratories with complementary expertise to develop and apply innovative or collaborative approaches to low dose research, although comparative studies between laboratories already using similar experimental approaches are also encouraged. At least one of the research partners must hold a DOE award focusing on low dose studies, and both research partners must have at least 1 year of support remaining on their core awards at the time of award (~November 2006). Collaborative glue awards can be set up with laboratories funded by such diverse agencies as DOE, NIH/NCI, NASA, DOD, EPA, the European Union, Canada, France, or Japan, but in any case the proposed research must be of interest to the DOE Low Dose Radiation Research Program. Proposals for these small awards should review the sections above on programmatic needs. Please note: the Project Description for the glue award proposal should not exceed ten pages.

III. Specifics for the Space Radiation Project (NASA)

The NASA/HRP Space Radiation Project is charged with providing input for the determination of health risks to humans visiting the space radiation environment. NASA is especially interested in human exposure to low fluences of high-energy particulate ionizing radiation (protons and heavy ions). Proposals whose principal focus is on low LET radiation are encouraged to include complementary research with high-energy particulate ionizing radiation that leverages progress, resources, and technology used for the low LET radiation research. Investigators with currently funded low dose projects may also apply for supplementary funding to address closely related research of interest to NASA.

The primary area of emphasis of the NASA/HRP Space Radiation Project is the development of mechanistic insights into biological effects of space radiation that account for radiation risks. Proposals are required to be hypothesis-driven and are expected to obtain their data in ground-based experimental radiobiology studies with protons and high-energy heavy ion beams in the energy range corresponding to space radiation. This is mainly a ground-based program using accelerator facilities to simulate space radiation. In addition to the research topics already described above this includes research on non-phenomenological predictors of late cell and tissue effects and the control and modification of radiation effect mechanisms

A description of the current awards in the Space Radiation Project may be found at: http://taskbook.nasaprs.com/peer_review/index.cfm. (Search by checking Radiation Health) A description of the ground-based facilities and experimental program at Brookhaven National Laboratory can be found at: [. The proton therapy facilities at Loma Linda University Medical Center are described at: http://research.hq.nasa.gov/code_u/bcpr/index.cfm](http://research.hq.nasa.gov/code_u/bcpr/index.cfm).

Research proposals to which NASA will assign high priority:

- a. Studies that increase the confidence in the accuracy of extrapolating the probability of radiation-induced genetic alterations or carcinogenesis from rodents to humans.
- b. Determination of carcinogenic risks following irradiation by protons and HZE particles.
- c. Determination if exposure to heavy ions at the level that would occur in deep space poses a risk to the integrity and function of the central nervous system.

This opportunity does not request proposals for flight research. Research proposals are expected to utilize beams of charged particles available at the NASA Space Radiation Laboratory (NSRL) or lower energy (< 250 MeV) protons at the Loma Linda University Medical Center Proton Treatment Facility, and to address experimental data obtained with such beams in ways leading to significant predictions that can be tested in future experiments.

NASA envisions that the selected proposals will be structured and operated in a manner that supports the country's educational initiatives and goals (including historically black colleges and universities and other minority universities), and in particular the need to promote scientific and technical education at all levels. NASA envisions that the selected proposals will support the goals for public awareness and outreach to the general public. The selected investigators are invited to participate in NASA-funded educational programs.

The particles of interest to the Space Radiation Project are protons with energies between 20 and 1000 MeV, and nuclei of elements with atomic numbers between helium and iron, with energies between 50 and 3000 MeV/nucleon. Fluences of interest are of the order of 1-2 particles per cell; studies with higher fluences will need to be justified by compelling arguments, including an explanation of how the results can be applied in the low fluence regime. NASA has developed facilities for use of protons at Loma Linda University Medical School and high-energy heavy ion beams at the NASA Space Radiation Laboratory (NSRL) at Brookhaven National Laboratory. Proposals should not budget for the use of beams at these facilities, which is paid by NASA. NASA will cooperate with DOE to provide the range of technical resources available for experimentation and analysis of experimental results at Brookhaven National Laboratory.

Program Funding

It is anticipated that up to \$3 million annually will be available from DOE for approximately 15 awards for this Announcement. Initial awards will be in Fiscal Year 2007, and proposals may request project support for up to three years. All awards are contingent on the availability of funds and programmatic needs. Multi-year funding of grant awards is expected, and is also contingent upon the availability of appropriated funds, progress of the research, and continuing program need. Additional funds of up to \$0.5 M annually will be available from NASA for joint funding of new research, also contingent upon the availability of funds. NASA provides beam time at the NSRL and the Loma Linda proton accelerator; investigators will not be required to pay for the beam time.

The Glue Awards should range between \$85,000 and \$125,000 per year, total costs, and run from 1 to 3 years.

Collaboration

Researchers are encouraged to collaborate with researchers in other institutions, such as universities, industry, non-profit organizations, federal laboratories and Federally Funded Research and Development Centers (FFRDCs), including the DOE National Laboratories, where appropriate, and to incorporate cost sharing and/or consortia wherever feasible. Additional information on collaboration is available in the Application Guide for the Office of Science Financial Assistance Program that is available via the Internet at: <http://www.science.doe.gov/grants/Colab.html>.

Any recipient of an award from the Office of Science, performing research involving recombinant DNA molecules and/or organisms and viruses containing recombinant DNA molecules shall comply with the National Institutes of Health "Guidelines for Research Involving Recombinant DNA Molecules," which is available via the World Wide Web at: <http://www.niehs.nih.gov/odhsb/biosafe/nih/rdna-apr98.pdf>, (59 FR 34496, July 5, 1994), or such later revision of those guidelines as may be published in the Federal Register.

DOE policy requires that potential researchers adhere to 10 CFR 745 "Protection of Human Subjects" or such later revision of those guidelines as may be published in the Federal Register. DOE requirements for reporting, protection of human and animal subjects and related special matters can be found on the World Wide Web at: <http://www.science.doe.gov/grants/Welfare.html>.

The Proposal

Full proposals adhering to DOE Field Work Proposal format (Reference DOE Order 412.1) are to be prepared and submitted consistent with policies of the investigator's laboratory and the local DOE Operations Office. Laboratories may submit proposals directly to the SC Program Office listed above. A copy should also be provided to the appropriate DOE Operations Office.

The instructions and format described below should be followed. You must reference Program Announcement LAB 06-10 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 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 formal merit review (peer review) and will be evaluated against the following criteria which are listed in descending order of importance:

Scientific and/or technical merit of the project

Appropriateness of the proposed method or approach

Competency of the personnel and adequacy of the proposed resources

Reasonableness and appropriateness of the proposed budget

The evaluation will include program policy factors such as the relevance of the proposed research to the terms of the announcement and the Department's programmatic needs. External peer reviewers are selected with regard to both their scientific expertise and the absence of conflict-of-interest issues. Non-federal reviewers may be used, and submission of an proposal constitutes agreement that this is acceptable to the investigator(s) and the submitting institution. Proposals found to be scientifically meritorious and programmatically relevant will be selected in consultation with DOE and NASA selecting officials depending upon availability of funds in each agency's budget. In the course of the selection process, projects will be identified as addressing DOE requirements, NASA requirements, or both. If a project is funded, beginning in the first year of funding, at least one member of the project team will be required to attend annual investigator meetings, and reasonable travel expenses may be submitted as part of the project budget. The selected projects will be required to acknowledge support by one or both agencies, as appropriate, in all public communications of the research results.

2. Summary of Proposal Contents

- Field Work Proposal (FWP) Format (Reference DOE Order 5700.7C) (DOE ONLY)
- Proposal Cover Page
- Table of Contents
- Abstract
- Narrative
- Literature Cited
- Budget and Budget Explanation
- Other Support of Investigator(s)
- Biographical Sketch(es)
- Description of Facilities and Resources
- Appendix

2.1 Number of Copies to Submit

A complete formal FWP in a single Portable Document Format (PDF) file must be submitted through the DOE ePMA system (<https://epma.doe.gov>) as an attachment. To identify that the FWP is responding to this program announcement, please fill in the following fields in the "ePMA Create Proposal Admin Information" screen as shown:

Proposal Short Name:

Fiscal Year:

Proposal Reason:

Program Announcement Number: Lab 06-10 *

Program announcement Title: Low Dose Radiation Research Program - Basic Biology*

Proposal Purpose:

Estimated Proposal Begin Date:

HQ Program Manager Organization:

* Please use the wording shown when filling in these fields to identify that the FWP is responding to this Program Announcement.

A CD and three copies of the proposal would also be appreciated, submitted using the following, by U.S. Postal Service Express Mail, any commercial mail delivery service, or when hand-carried to:

Dr. Noelle F Metting U.S. Department of Energy Office of Biological and Environmental Research, SC-23.1/GTN 19901 Germantown Road Germantown, MD 20874-1290 ATTN: Program Announcement LAB 06-10.

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 their proposals. 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 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 5700.7C) (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.

Laboratories may submit proposals directly to the SC Program office listed above. A copy should also be provided to the appropriate DOE operations office.

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
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 Abstract

Provide an abstract of no more than 250 words. Give the broad, long-term objectives and what the specific research proposed is intended to accomplish. State the hypotheses to be tested. Indicate how the proposed research addresses the SC scientific/technical area specifically described in this announcement.

3.5 Narrative

The narrative comprises the research plan for the project and is limited to 20 pages (or 10 pages for Glue Awards). It should contain the following subsections:

Background and Significance: Briefly sketch the background leading to the present proposal, critically evaluate existing knowledge, and specifically identify the gaps which the project is

intended to fill. State concisely the importance of the research described in the proposal. Explain the relevance of the project to the research needs identified by the Office of Science. Include references to relevant published literature, both to work of the investigators and to work done by other researchers.

Preliminary Studies: Use this section to provide an account of any preliminary studies that may be pertinent to the proposal. Include any other information that will help to establish the experience and competence of the investigators to pursue the proposed project. References to appropriate publications and manuscripts submitted or accepted for publication may be included.

Research Design and Methods: Describe the research design and the procedures to be used to accomplish the specific aims of the project. Describe new techniques and methodologies and explain the advantages over existing techniques and methodologies. As part of this section, provide a tentative sequence or timetable for the project.

Subcontract or Consortium Arrangements: If any portion of the project described under "Research Design and Methods" is to be done in collaboration with another institution, provide information on the institution and why it is to do the specific component of the project. Further information on any such arrangements is to be given in the sections "Budget and Budget Explanation", "Biographical Sketches", and "Description of Facilities and Resources".

3.6 Literature Cited

List all references cited in the narrative. Limit citations to current literature relevant to the proposed research. Information about each reference should be sufficient for it to be located by a reviewer of the proposal.

3.7 Budget and Budget Explanation

A detailed budget is required for the entire project period, which normally will be three years, 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/Forms-E.html>.

3.8 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 devoted to the project.

3.9 Biographical Sketches

This information is required for senior personnel at the laboratory submitting the proposal and at all subcontracting institutions. The biographical sketch is limited to a maximum of two pages for each investigator.

3.10 Description of Facilities and Resources

Describe briefly the facilities to be used for the conduct of the proposed research. Indicate the performance sites and describe pertinent capabilities, 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.

3.11 Appendix

Include collated sets of all appendix materials with each copy of the proposal. Do not use the appendix to circumvent the page limitations of the proposal. Information should be included that may not be easily accessible to a reviewer.

Reviewers are not required to consider information in the Appendix, only that in the body of the proposal. Reviewers may not have time to read extensive appendix materials with the same care as they will read 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 \$25,000 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.