Program Announcement
To DOE National Laboratories
LAB 03-12

Environmental Management Science Program (EMSP) Research Related to Transuranic and Mixed Wastes

SUMMARY: The Office of Biological and Environmental Research (OBER) of the Office of Science (SC), U.S. Department of Energy (DOE), hereby announce its interest in receiving research proposals to support the performance of innovative, fundamental research on the characterization of transuranic (TRU) and mixed wastes (MW) that are currently stored at DOE sites, or will be produced as part of DOE's environmental cleanup efforts.

DATES: The deadline for receipt of formal proposals is 4:30 P.M., E.S.T., Tuesday, March 4, 2003, in order to be accepted for merit review and to permit timely consideration for award in Fiscal Year 2003.

ADDRESSES: Formal proposals in response to this solicitation are to be submitted as PDF files on CDs. Three CDs should be submitted for each proposal. Color images should be submitted as a separate file in PDF format and identified as such. These images should be kept to a minimum due to the limitations of reproducing them. They should be numbered and referred to in the body of the technical scientific proposal as Color image 1, Color image 2, etc.

The CDs, referencing Program Announcement LAB 03-12, should be sent to: Environmental Remediation Sciences Division, SC-75/Germantown Building, Office of Biological and Environmental Research, Office of Science, U.S. Department of Energy, 1000 Independence Avenue, SW, Washington, D.C. 20585-1290, ATTN: Program Announcement LAB 03-14.

When submitting by U.S. Postal Service Express Mail, any commercial mail delivery service, or when hand carried by the researcher, the following address must be used: Environmental Remediation Sciences Division, SC-75, Office of Biological and Environmental Research, Office of Science, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874-1290, ATTN: Program Announcement LAB 03-12.

FOR FURTHER INFORMATION CONTACT:

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Mail Stop F-237
Medical Sciences Division
Office of Biological and Environmental Research
SC-73/Germantown Building

U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585
telephone: (301) 903-9009
facsimile: (301) 903-0567
E-mail: roland.hirsch@science.doe.gov

Or

Mr. Mark Gilbertson
Office of Science and Technology
Office of Environmental Management, EM-50
1000 Independence Avenue, SW
Washington, D.C. 20585
telephone: (202) 586-7150
facsimile: (202) 596-1492
E-mail: mark.gilbertson@em.doe.gov

SUPPLEMENTARY INFORMATION:

The Environmental Management Science Program: Over the past 60 years, the United States created an industrial complex to develop, test, manufacture, and maintain nuclear weapons for national security purposes. The production and testing of nuclear weapons created a legacy of significant environmental contamination, ranging from uranium mining and milling, waste disposal, and radionuclide migration in ground water and soil. In 1995, the 104th Congress authorized creation of the Environmental Management Science Program (EMSP) to develop a long term, basic science infrastructure that would focus on scientific and technical challenges facing DOE's environmental cleanup effort. Since its inception in 1996, the Program has held seven competitions and has awarded over $320 million in funding to nearly 400 research projects. To address the largest environmental cleanup program in the world, from a cost perspective, EMSP has the following objectives:

- to provide scientific knowledge that will revolutionize technologies and cleanup approaches to significantly reduce future costs, schedules, and risks;
- to "bridge the gap" between broad fundamental research that has wide-ranging applicability and needs-driven applied technology development;
- to focus the Nation's science infrastructure on critical DOE environmental management problems.

Basic research proposed under this Notice should contribute to DOE's environmental management activities by decreasing risk for the public and workers, providing opportunities for major cost reductions, reducing the time required to achieve DOE's mission goals, and, in general, should address problems that are considered intractable without new knowledge.

TRU and Mixed Waste Challenge: DOE's inventory of transuranic and mixed wastes (TM wastes) includes about 155,000 cubic meters of waste stored on some 30 DOE sites and another

450,000 cubic meters of buried waste-at least some of which is likely to require retrieval in the course of DOE's site cleanup program. Most of the stored inventory is in 55-gallon drums or other containers. Although some of the buried waste is similarly packaged, knowledge of the condition of the containers and their contents is limited.

Information on DOE's waste inventory has been summarized in a recent report (USDOE, 2001), and is also available via the World Wide Web at DOE's Central Internet Database (http://cid.em.doe.gov). A short summary of the nature of DOE's TM wastes, including definitions of TRU and MW, is given in the "Background Information" section of this Notice.

While DOE is making a concerted effort to accelerate the removal of TM wastes from its sites, the size of the inventory translates to a multi-decade effort that will require handling, characterizing, shipping, and disposing of hundreds of thousands of waste drums and other containers at a total cost of billions of dollars.

Overall, it is the intent of this Notice to solicit and encourage research that will provide the scientific basis for the new technologies and approaches that will be necessary to characterize DOE's MW and TRU wastes over the next decades, and to enhance the quantity and quality of scientific information available for decision-making.

Research Needs: This research Notice has been developed for Fiscal Year 2003, with the primary objective of developing scientific knowledge that will enable major advances in technologies available for characterizing TRU and MW waste. This section provides a summary of research needs in this area, and is based on a National Academy of Sciences, National Research Council (NRC) report published in 2002 entitled "Research Opportunities for Managing the Department of Energy's Transuranic and Mixed Wastes (National Research Council, 2002"). That report identified significant knowledge gaps and research opportunities in a number of areas; however, due to the limited funds expected to be available to support new EMSP projects in Fiscal Year 2003, this Notice focuses on research needs for waste characterization, including characterization and detection of buried wastes.

Research is needed to improve the efficiency of characterizing DOE's TRU and mixed waste inventory. This includes research toward developing faster and more sensitive characterization and analysis tools to reduce costs and accelerate throughput, particularly for waste that produces sufficient penetrating radiation that it requires remote handling. It also includes research to develop a fuller understanding of how waste characteristics may change with time (chemical, biological, radiological, and physical processes) to aid in decision making about disposition paths and to simplify the demonstration of regulatory compliance.

Determining the physical, chemical, and radiological properties of TM wastes pertinent to handling, processing, transportation, and storage is costly and time-consuming. The problem is amplified by the wide variety of the wastes and their heterogeneity. Improving and simplifying waste characterization can reduce costs and increase the rate of shipping wastes to disposal facilities.

There is a need for faster and more sensitive characterization technologies, for making automated sampling more reliable, and for improving statistical sampling methods. There is a lack in basic knowledge of how waste characteristics may change with time, including both short-term changes that affect storage and shipment and long-term changes that may occur in a disposal facility. This lack of knowledge drives conservatism in characterization, transportation, and disposal requirements. Possible microbial effects in waste have generally been ignored.

The greatest challenges for the next generation of characterization technologies will be to provide the following:

- more rapid, automated nondestructive assay and evaluation methods;
- more sensitive nondestructive assay and evaluation technologies for larger containers and hard-to-detect contaminants; and
- improved methods, based on fundamental modeling, to derive present and future waste characteristics from a limited number of sampling parameters.

Research toward new, noninvasive, remote imaging and image recognition methods and in-drum sensors to provide faster and more sensitive technologies for characterization could lead to significant savings in time, cost, and risk of worker exposure. Although noninvasive diagnostics are highly preferred, the use of minimally invasive sensors also has promise.

Research is needed to evaluate the microbiology of MW and TRU wastes. This research should focus on identifying the microorganisms that exist in the waste, and evaluating their relationship to waste materials (i.e., whether these microbes affect the hazardous or radioactive components of the waste in ways that make it more or less toxic, or more or less suitable for disposal in hazardous waste, low-level waste, or other landfills or repositories. Additional research is needed to develop tools for rapidly diagnosing microbial activity or identifying specific microbes.

One of the most beneficial cost-saving tools would be the formulation of more reliable predictive models, validated by experimental data, of how waste characteristics may change with time due to chemical, biological, radiological, and physical processes. This would be most useful in predicting deleterious processes that might occur in the waste, such as gas generation or matrix degradation.

PROGRAM FUNDING: It is anticipated that up to a total of $2,000,000 of Fiscal Year 2003 funds will be available for new EMSP awards resulting from this Notice. Multiple-year funding of awards is anticipated, contingent upon the availability of appropriated funds. Award sizes are expected to be on the order of $100,000-$300,000 per year for total project costs for a typical three-year award. Collaborative projects involving several research groups or more than one institution may receive larger awards if merited. The program will be competitive and offered to investigators in universities or other institutions of higher education, other non-profit or for-profit organizations, non-Federal agencies or entities, or unaffiliated individuals. DOE reserves the right to fund in whole or part any or none of the proposals received in response to this Announcement. All projects will be evaluated using the same criteria, regardless of the submitting institution. DOE is under no obligation to pay for any costs associated with the preparation or submission of proposals if an award is made.

COLLABORATION AND TRAINING: Researchers to the EMSP are encouraged to collaborate with researchers in other institutions, such as universities, industry, non-profit organizations, federal laboratories and FFRDCs, including the DOE National Laboratories, where appropriate. Researchers are also encouraged to provide training opportunities, including student involvement, in proposals submitted to EMSP.

PROPOSAL FORMAT: Researchers are expected to use the following format in addition to following instructions given below in the Office of Science Guide for Preparation of Scientific/Technical Proposals to be Submitted by National Laboratories. Proposals must be written in English, with all budgets in U.S. dollars. In the case of proposals involving multiple institutions, only one proposal that encompasses the entire scope of the proposed research should be submitted; however, the proposal should include separate budgets and budget explanations for each participating institution.

- Field Work Proposal (FWP) Format (Reference DOE Order 5700.7C) (DOE ONLY)
- Proposal classification sheet (a plain sheet of paper with one selection from the list of scientific fields listed in the Proposal Categories Section)
- Table of Contents
- Project Abstract (no more than one page)
- Budgets for each year and a summary budget page for the entire project period (using DOE F-4620.1)
- Budget Explanation. (Note: researchers are requested to include in the travel budget funds to attend: (1) an initial research kick-off meeting; (2) an annual EMSP workshop; and (3) one or more extended visits (1 to 2 weeks in duration) to a cleanup site by the Principal Investigator, a senior staff member, or a collaborator
- Budgets and Budget explanations for each collaborating institution, if any
- Project Narrative (recommended length is no more than 20 pages; multi- investigator collaborative projects may use more pages if necessary, up to a total of 35 pages)
    - Project Goals
    - Significance of Project to the EM Mission
    - Background
    - Preliminary Studies (if applicable) and/or Summary of Results from Previous Research (if proposal is a renewal)
    - Research Plan
    - Research Design and Methodologies
- Literature Cited
- Collaborative Arrangements (if applicable)
- Biographical Sketches of Senior Investigators (limit 2 pages per investigator)
- Description of Facilities and Resources
- Current and Pending Support for each senior investigator

PROPOSAL CATEGORIES: In order to properly classify each proposal for evaluation and review, the documents must indicate the researcher's preferred scientific research field, selected from the following list.

Field of Scientific Research:
1. Actinide Chemistry
2. Analytical Chemistry and Instrumentation
3. Engineering Sciences
4. Geochemistry
5. Geophysics
6. Inorganic Chemistry
7. Materials Science
8. Biology (including Microbiology)
9. Other

PROPOSAL EVALUATION AND SELECTION:

Relevance to Mission: In addition to the formal scientific merit review, proposals that are judged to be scientifically meritorious will be evaluated by DOE for relevance to the objectives of EMSP. DOE will also consider, as part of the evaluation, program policy factors such as an appropriate balance among the program areas, including research already in progress. Additional information about the general program can be found at: http://emsp.em.doe.gov. Past research solicitations, abstracts, and research reports of projects funded under EMSP can be found at: http://emsp.em.doe.gov/researcher.htm.

Researchers are encouraged to demonstrate a linkage between their research projects and significant problems related to MW and TRU waste at DOE sites. This linkage can be established in a variety of ways; for example, by elucidating the scientific problems to be addressed by the proposed research and explaining how the solution of these problems could lead to improved capabilities that would reduce costs, accelerate throughput, or reduce the risk of worker exposure. It is understood that given the nature of basic research, there will not always be a clear pathway between research results and application to site remediation.

A listing of points of contact and site web pages is provided for researchers who may have site-specific questions related to TRU and MW problems:

Hanford (http://www.hanford.gov): Rudy Garcia, (509) 376-5494, Rudolph_F_Garcia@rl.gov.

Idaho (http://www.id.doe.gov): William Owca, (208) 526-1983, owcawa@id.doe.gov.

Oak Ridge (http://www.oro.doe.gov): for TRU - Gary Riner, (805) 241-3498, rinerg@oro.doe.gov; for MW - Brian Westich, (805) 241-2198, westichb@oro.doe.gov.

Savannah River (http://sro.srs.gov): for TRU - Bert Crapse, (803) 725-9866, Herbert.Crapse@srs.gov or Ann Gibbs, (803) 952-2265, Ann.Gibbs@srs.gov; for MW - Mike Simmons, (803) 725-1627, Jonathan.Simmons@srs.gov or Bernie Mayancsik, (803) 952-2271, Bernadette.Mayancsik@srs.gov.

Waste Isolation Pilot Plant (http://www.wipp.carlsbad.nm.us): George Basabilvazo, (505) 234-7488, George.Basabilvazo@wipp.ws

BACKGROUND INFORMATION: Information on DOE's waste inventory has been summarized in a recent report (USDOE, 2001), and is also available via the World Wide Web at DOE's Central Internet Database (http://cid.em.doe.gov). The two categories of waste listed in these sources that are pertinent to this Notice are transuranic (TRU) and mixed low-level waste (MLLW). Transuranic waste is defined by DOE Order 435.1 as waste that contains more than 100 nanocuries *per* gram arising from alpha-emitting radionuclides having atomic numbers greater than that of uranium (92) and half-lives greater than 20 years. Low-level waste (LLW) is defined in the Low-Level Radioactive Policy Amendments Act of 1985 by what it is **not**, and consequently is a very broad category of waste. LLW is defined as waste that is not spent nuclear fuel, not high-level waste resulting from reprocessing of spent nuclear fuel, and not byproduct material as defined in section 11e.2 of the Atomic Energy Act of 1954. LLW encompasses materials that are slightly above natural radiation background levels to highly radioactive materials that require extreme caution when handling. Hazardous waste is defined by the U.S. Environmental Protection Agency (EPA) in Title 40 of the Code of Federal Regulations, Parts 260 and 261, as a subset of solid wastes that pose substantial or potential threats to public health or the environment and that meet any of the following three criteria: (1) waste that is specifically listed as a hazardous waste by EPA; (2) waste that exhibits one or more of the characteristics of hazardous waste (ignitability, corrosiveness, reactivity, and/or toxicity); or (3) waste that is generated by the treatment of hazardous waste, or is contained in a hazardous waste. Mixed low-level waste (MLLW) is waste that meets the above definitions of both LLW and hazardous waste. It contains low levels of radioactive contamination as well as materials that are chemically hazardous. Mixed transuranic waste (MTRU) is waste that meets the definitions of both TRU and hazardous wastes. The EPA estimates that over half of DOE's TRU inventory is MTRU (EPA 2002); however, because all of DOE's retrievably stored, defense TRU wastes are slated for disposal in the Waste Isolation Pilot Plant (WIPP), DOE no longer distinguishes MTRU as a special category in its inventory (USDOE, 2001).

Since 1970, DOE sites have stored most TRU waste and MW in retrievable 55-gallon drums or larger containers for future treatment (if needed) and disposal. Prior to 1970, DOE sites buried materials that meet the current definition of TRU waste and MW in shallow land facilities, within about 30 meters of the surface. A much smaller fraction of these wastes were buried at depths between 30 and 300 meters. Most of this waste was buried in 55-gallon drums; however, some was buried in other types of containers, and some had no form of durable containment. At the time, DOE considered buried wastes to be permanently disposed, but some of the buried wastes may require retrieval and treatment.

The previous practice of discharging low-level liquid wastes to retention basins has resulted in the generation of contaminated soils and sediments. DOE recognizes that some of these materials are sufficiently contaminated to warrant retrieval. Such materials are termed "ex-situ contaminated media" in the inventory summary (USDOE 2001). If they are retrieved, both the pre-1970 buried wastes and the ex-situ media will be considered newly generated waste. In addition to these historical wastes, activities at DOE sites, including environmental cleanup activities, will continue to generate new MLLW and TRU wastes over the next several decades.

The materials making up DOE's inventory of MW and TRU wastes are extremely diverse. This diversity was described in a report (USDOE, 1995) based on data compiled by the various DOE sites in order to develop site remediation plans. The inventory was divided into five groups, each with various subcategories:

1. Debris

    - metallic debris (including materials containing lead and cadmium)
    - inorganic, nonmetallic debris (*e.g.*, concrete, glass, graphite, and rock)
    - organic debris (*e.g.*, such as rubber, leaded gloves, halogenated and nonhalogenated plastics, wood, paper, and biological materials
    - heterogeneous debris (*e.g.*, composite fillers, asphalt, electronic equipment, and other types of organic and inorganic materials)

2. Inorganic homogenous solids and soils

    - homogeneous solids (*e.g.*, ash, sandblasting media, inorganic particulate absorbents, absorbed organic liquids, inorganic ion-exchange media, metal chips and turnings, glass, ceramics, and activated carbon)
    - sludges (e.g., sludges arising from wastewater treatment ponds, off-gas treatment, plating activities, and low-level reprocessing)
    - other wastes (e.g., paint chips, solids, and sludges, salt waste containing chlorides, sulphates, nitrates, metal oxides/hydroxides, and other inorganic chemicals)
    - solidified homogeneous solids (e.g., soil and gravel)

3. Organics

    - liquids (aqueous streams containing both halogenated and nonhalogenated organic compounds)
    - homogeneous solids (e.g., particulate matter such as resins and absorbents, biological sludges, halogenated and nonhalogenated organic sludges, and organic chemicals)

4. Unique wastes

    - Lab packs (e.g., organic, aqueous, and solid laboratory chemicals and scintillation cocktails)
    - Special wastes (e.g., elemental mercury, lead, and cadmium, beryllium dust, batteries, reactive metals in bulk and as contamination in/on other components, pyrophoric particulates, explosives or propellants, and compressed gasses and aerosols)
    - All others (materials placed in a final waste form are included in this category)

5. Wastewaters

- Aqueous liquids and slurries ranging from acidic to basic pH, including cyanide-containing materials.

The 1995 inventory also characterized DOE's level of confidence as to how well the wastes were characterized. In general terms, DOE has high or medium confidence that the physical nature (i.e., soil or sludge) of most wastes is correctly identified, but it lacks confidence in the existing quantitative data on the wastes' chemical and radioactive constituents.

The volume and diversity of DOE's MW and TRU wastes pose significant challenges for disposing of this waste. Currently, DOE's TRU waste disposal efforts are focused on maximizing the utility of the WIPP. Several hundred thousand drums of TRU waste will need to be shipped to WIPP, and the characterization required for shipping and acceptance at the WIPP currently requires many hours and costs thousands of dollars for each drum of waste generated prior to 1999. Methods to improve characterization are therefore likely to result in significant savings of time and money.

Some components in TRU waste are problematic for shipping to or disposal in the WIPP. About two percent (approximately 14,200 drum equivalents) of DOE's TRU waste contains organic materials that continue to pose shipping problems due to potential gas generation, especially of hydrogen. Drums containing reactive and corrosive chemicals, as well as drums containing liquids, sealed containers, and gas cylinders (including paint cans) may not be accepted by the WIPP, and they are currently removed by manually sorting through the waste. Waste that is contaminated with polychlorinated biphenyls (PCBs) constitutes about one percent of the inventory, and currently cannot be accepted by the WIPP. Approximately two to four percent of the TRU waste inventory produces sufficient penetrating radiation from fission products that it requires remote handling, rather than hands-on operator contact. The requirement for remote handling greatly increases the cost and difficulty of characterizing, treating, and packaging or repackaging of this waste. Meeting the per-drum limits on heat generation and fissile material content can necessitate repackaging of the waste. In addition to increasing the waste volume, repackaging to meet these limits is expensive, time-consuming, and creates the potential for worker exposure.

DOE currently relies primarily on private contractors and commercial facilities for treating and disposing of its MLLW. (MLLW cannot be disposed in the WIPP because under current law, only TRU waste can be disposed there). The characterization and treatment of MLLW that will be necessary to meet the disposal requirements of the Resource Conservation and Recovery Act (RCRA) have received relatively little attention compared to TRU waste. Despite the general lack of quantitative chemical characterization, it is known that much of DOE's MLLW inventory contains hazardous chemicals that can be difficult to treat (e.g., heavy metals, solvents and other organics, and mercury). Furthermore, there is considerable commingling of these materials, which complicates the selection of disposition options. MLLW that contains certain specified materials is prohibited from near-surface disposal under current EPA and Nuclear Regulatory Commission (NRC) regulations. These include the following:

- liquids,
- reactive or explosive materials,

- flammable materials,
- untreated biological material,
- materials that may emit toxic gases or fumes,
- other materials subject to the EPA's land disposal restrictions, as listed in 40 CFR 268,
- radioactive isotopes that exceed the NRC limits for Class C wastes (>700 Ci/m3 of 63Ni, or >7,000 Ci/ m3 of 90Sr, or >4,600Ci/ m3 of 137Cs).

In order to be disposed, these wastes will require treatment that may be difficult and expensive. Characterization of the wastes is a necessary first step in the selection of disposition options.

REFERENCES:

National Research Council, 2002, Research Opportunities for Managing the Department of Energy's Transuranic and Mixed Wastes. National Academy Press, Washington, D.C., 118pp. http://www.nap.edu/books/0309084717/html/

USEPA, 2002, Mixed Waste Glossary. EPA Radiation Protection Program Waste Management Team. Available at: http://www.epa.gov/radiation/mixed-waste/mw_pg5.htm

USDOE, 1995, The DOE National 1995 Mixed Waste Inventory Report. U.S. Department of Energy, Washington D.C.

USDOE, 2001, Summary Data on the Radioactive Waste, Spent Nuclear Fuel, and Contaminated Media Managed by the U.S. Department of Energy. April 2001, U.S. Department of Energy, Washington D.C. http://cid.em.doe.gov/

The instructions and format described below should be followed. Reference Program Announcement LAB 03-12 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, the uniqueness of the proposer's capabilities, and demonstrated usefulness of the research for proposals in other DOE Program Offices as evidenced by a history of programmatic support directly related to the proposed work.

2. Summary of Proposal Contents

Field Work Proposal (FWP) Format (Reference DOE Order 5700.7C) (DOE ONLY)
Proposal Cover Page
Table of Contents
Abstract
Budget and Budget Explanation for submitting laboratory
Budget and Budget Explanation for any collaborating organizations
Narrative
Literature Cited
Other support of investigators
Biographical Sketches
Description of facilities and resources
Appendix

2.1 Number of Copies to Submit

An original and seven copies of the formal proposal/FWP must be submitted. (Unless otherwise instructed in this Program Announcement.)

3. Detailed Contents of the Proposal

Proposals must be readily legible, when photocopied, and must conform to the following three requirements: the height of the letters must be no smaller than 10 point with at least 2 points of spacing between lines (leading); the type density must average no more than 17 characters per inch; the margins must be at least one-half inch on all sides. Figures, charts, tables, figure legends, etc., may include type smaller than these requirements so long as they are still fully legible.

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

> If other institutions are participating in the project include a table listing institution, lead investigator at that institution and requested funding for each institution at this point on the cover page.

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 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.sc.doe.gov/production/grants/forms.html

3.6 Narrative

The narrative comprises the research plan for the project and is limited to 25 pages. It should contain the following subsections (plus any others specific to this Notice):

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. The name of the institution and lead investigator, and total requested budget for each such institution should be listed on the title page 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".

3.7 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.

3.8 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.