Office of Science
Notice 03-13

Natural and Accelerated Bioremediation Research Program

Department of Energy

Office of Science Financial Assistance Program Notice 03-13: Natural and Accelerated Bioremediation Research Program

AGENCY: U.S. Department of Energy

ACTION: Notice inviting grant applications.

SUMMARY: The Office of Biological and Environmental Research (OBER) of the Office of Science (SC), U.S. Department of Energy (DOE), hereby announces its interest in receiving applications for research grants in the Natural and Accelerated Bioremediation Research (NABIR) Program. The goal of the NABIR program is to provide the fundamental science that will serve as the basis for development of cost-effective bioremediation and long-term stewardship of radionuclides and metals in the subsurface at DOE sites. The focus of the program is on strategies leading to long-term immobilization of contaminants in place to reduce the risk to humans and the environment. Research should address bioremediation of uranium, technetium, plutonium, chromium or mercury. NABIR is focused on subsurface sediments below the zone of root influence and includes both the vadose (unsaturated) zone and the saturated zone (groundwater and sediments). Applications should describe research projects in one or more of the following program elements: Biogeochemistry, Biotransformation, Community Dynamics and Microbial Ecology, Biomolecular Science and Engineering, Assessment, and Bioremediation and its Societal Implications and Concerns. Studies that integrate research from more than one NABIR element are strongly encouraged.

DATES: Researchers are strongly encouraged (but not required) to submit a preapplication for programmatic review. Preapplications will be accepted on an ongoing basis, however, early submission of preapplications is encouraged, to allow time for review for programmatic relevance. A brief preapplication should consist of one or two pages of narrative describing the research objectives and methods.

The deadline for receipt of formal applications is 4:30 p.m., E.S.T., March 11, 2003, to be accepted for merit review and to permit timely consideration for awards late in Fiscal Year 2003 or in early Fiscal Year 2004.

ADDRESSES: Preapplications referencing Program Notice 03-13 should be sent by E-mail to anna.palmisano@science.doe.gov.

Formal applications in response to this solicitation are to be electronically submitted by an authorized institutional business official through DOE's Industry Interactive Procurement System (IIPS) at: http://e-center.doe.gov/. IIPS provides for the posting of solicitations and receipt of applications in a paperless environment via the Internet. In order to submit applications through IIPS your business official will need to register at the IIPS website. The Office of Science will include attachments as part of this notice that provide the appropriate forms in PDF fillable format that are to be submitted through IIPS. Color images should be submitted in IIPS 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 application as Color image 1, Color image 2, etc. Questions regarding the operation of IIPS may be E-mailed to the IIPS Help Desk at: HelpDesk@pr.doe.gov or you may call the help desk at: (800) 683-0751. Further information on the use of IIPS by the Office of Science is available at: http://www.sc.doe.gov/production/grants/grants.html.

If you are unable to submit an application through IIPS please contact the Grants and Contracts Division, Office of Science at: (301) 903-5212 in order to gain assistance for submission through IIPS or to receive special approval and instructions on how to submit printed applications.

FOR FURTHER INFORMATION CONTACT: Dr. Anna Palmisano, Environmental Remediation Sciences Division, SC-75/Germantown Building, Office of Biological and Environmental Research, Office of Science, U.S. Department of Energy, 1000 Independence Ave., SW, Washington, D.C. 20585-1290, telephone: (301) 903-9963, E-mail: anna.palmisano@science.doe.gov, fax: (301) 903-8519. The full text of Program Notice 03-13 is available via the Internet using the following web site address: http://www.sc.doe.gov/production/grants/grants.html.

SUPPLEMENTARY INFORMATION:

Background

For more than 50 years, the U.S. created a vast network of more than 113 facilities for research, development, testing and production of nuclear weapons. As a result of these activities, subsurface contamination has been identified at over 7,000 discrete sites across the U.S. Department of Energy complex. With the end of the Cold War threat, the DOE has shifted its emphasis to remediation, decommissioning, and decontamination of contaminated groundwater, sediments, and structures at its sites. DOE is currently responsible for remediating 1.7 trillion gallons of contaminated groundwater and 40 million cubic meters of contaminated soil. It is estimated that more than 60% of DOE facilities have groundwater contaminated with metals or radionuclides. More than 50% of all DOE facilities have soils or sediments contaminated with radionuclides and metals. While virtually all of the contaminants found at industrial sites nationwide can also be found at DOE sites, many of the metals and most of the radionuclides are unique to DOE sites. The NABIR program aims: 1) to provide the fundamental knowledge that may lead to new remediation technologies or strategies for radionuclides and metals; and 2) to advance the understanding of the key microbiological and geochemical processes that control the effectiveness of *in situ* immobilization as a means of long term stewardship, and how these processes impact contaminant transport.

While bioremediation of organic contaminants involves their biotransformation to benign products such as carbon dioxide, bioremediation of radionuclides and metals involves their removal from the aqueous phase to reduce risk to humans and the environment. Microorganisms can directly affect the solubility of radionuclides and metals by changing their oxidation state to a reduced form that leads to *in situ* immobilization. Or, microorganisms can indirectly immobilize radionuclides and metals through the reduction of inorganic ions that can, in turn, chemically reduce contaminants to less mobile forms. The long term stability of these reduced contaminants is as yet unknown.

Currently, the fundamental knowledge that would allow cost-effective deployment of *in situ* subsurface bioremediation of radionuclides and metals is lacking. The focus of the NABIR program is on radionuclides and metals that: 1) pose the greatest potential risk to humans and the environment at DOE sites; and 2) are amenable to for immobilization by means of bioremediation. Thus, research is focused on the radionuclides uranium, technetium and plutonium and the metals chromium and mercury. Radioactive contaminants such as tritium and cobalt are not a focus because of their relatively short half lives, and strontium and cesium are not addressed because they are not readily amenable to biotransformation. Research is focused on subsurface sediments below the zone of root influence and includes both the vadose (unsaturated) zone and the saturated zone (both groundwater and sediments). NABIR research is oriented toward areas that have low levels of widespread contamination; it is too costly to clean up those situations with existing technologies. Uranium, technetium, and chromium can be especially mobile in the subsurface under certain conditions; they are risk-driving contaminants at some DOE sites. The effects of co-contaminants such as nitrate, complexing agents (such as EDTA) and chlorinated solvents (such as trichloroethylene and carbon tetrachloride) on the behavior of radionuclides and metals in the subsurface is also of interest to the NABIR program.

NABIR Program

The goal of the NABIR program is to provide the fundamental science that will serve as the basis for development of cost-effective bioremediation and long-term stewardship of radionuclides and metals in the subsurface at DOE sites. The focus of the program is on strategies leading to long-term immobilization in place of contaminants to reduce the risk to humans and the environment. The NABIR program encompasses both intrinsic bioremediation by naturally occurring microbial communities, as well as accelerated bioremediation through the use of biostimulation (addition of inorganic or organic nutrients). The NABIR Program supports hypothesis-driven, basic research that is more fundamental in nature than demonstration projects. Research on phytoremediation will not be supported by this solicitation; a separate solicitation for a Joint Interagency Program on Phytoremediation Research can be found at: http://www.sc.doe.gov/production/grants/Fr03-04.html.

Naturally occurring subsurface microbes may be involved in intrinsic bioremediation of radionuclides and metals by reduction and immobilization, either directly or indirectly. However, these natural processes typically occur at fairly slow rates, and there may be a need to use biostimulation to enhance the rates. The primary focus of the NABIR program is on biostimulation strategies, due to the ubiquity of metal-reducers in nature. Immobilized radionuclides and metals are not removed from the subsurface as may occur with excavation, pump and treat, or biodegradation of organic contaminants. Immobilization is focused on containment in vadose zone and groundwater plumes. As such, it may be a strategy applied to prevent the discharge of deep or widely distributed contaminants from the vadose zone to groundwater, or from groundwater to a receiving water body (e.g., the Columbia River at Hanford). *In situ* immobilization of contaminants is one approach to long term stewardship, which is the post-closure responsibility of DOE at its contaminated sites. Long term stewardship involves long-term monitoring and other maintenance activities to ensure that residual in-ground contaminants do not spread further. Therefore, an important aspect to the NABIR program is to assess factors controlling the long-term stability of the immobilized contaminants and to devise approaches (biological/chemical) to maintain their immobilization through the stewardship phase.

The NABIR program consists of four interrelated Science Elements (Biogeochemistry, Biotransformation, Community Dynamics and Microbial Ecology, and Biomolecular Science and Engineering). Innovative method development for the Science Elements is supported under the Assessment Element. The program also includes an element addressing ethical, legal and societal issues called Bioremediation and its Societal Implications and Concerns (BASIC). The NABIR program strongly encourages researchers to integrate laboratory and field research at DOE or DOE-relevant sites. More information on the NABIR program may be found at: http://www.lbl.gov/NABIR.

The NABIR Field Research Center (FRC) and Other Field Research Sites

The NABIR FRC provides a site for investigators to conduct field-scale research and to obtain DOE-relevant subsurface samples for laboratory-based studies of bioremediation. The FRC is located on the U.S. Department of Energy Oak Ridge Reservation in Oak Ridge, Tennessee, and it is operated by the Environmental Sciences Division of the Oak Ridge National Laboratory. The contaminated and background (uncontaminated control) areas are located in Bear Creek Valley (BCV) within the Y-12 Plant area. See: http://www.esd.ornl.gov/nabirfrc for more detailed information on the NABIR FRC.

The contaminated research site at the FRC is a 98-hectare plot containing uranium, nitrate, technetium, strontium, and cadmium in groundwater, soils, and sediments. To a lesser extent, metals such as mercury, copper, zinc, and lead, and organics such as acetone, methylene chloride, tetrachloroethylene, and toluene are also present. The contaminated area includes the commingled groundwater plumes that originated from a combination of the S-3 Waste Disposal Ponds and the Bone Yard/Burn Yard. Both the background and contaminated areas are well-characterized and well-instrumented, and should be available for a duration of five to ten years. The water table resides between 0 and 3 m below the surface and is readily accessible through multilevel groundwater monitoring wells.

The initial focus of NABIR field research is on *in situ* biostimulation experiments to promote immobilization of uranium. Understanding natural and stimulated uranium biotransformation in the presence of high nitrate and low pH in unconsolidated residuum and fractured rock is one of the biggest challenges at the FRC at Oak Ridge, and at other DOE sites. NABIR researchers conduct controlled, field-scale hypothesis testing at the FRC. In addition, the FRC is currently providing subsurface samples for 20 laboratory-based NABIR projects. These projects span all NABIR Science Elements as well as the cross-cutting Assessment and BASIC Elements. Site characterization activities are ongoing and will result in a rich database for use by NABIR researchers. The FRC is responsible for data management, systems integration, and fundamental hydrological and geochemical modeling of the contaminated and background sites. The FRC makes these data and models accessible to all NABIR researchers.

While the FRC provides a major focus for the NABIR program, it is recognized that other sites that represent the different hydrogeological regimes found at DOE sites will also be valuable to researchers. A large fraction of the national inventory of DOE wastes resides in unconsolidated, porous media in relatively thick, vadose zones and in groundwaters low in soluble organic carbon. For this reason, NABIR investigators are encouraged to take advantage of opportunities to collect and analyze samples from arid western environments that typify the Hanford Reservation and Uranium Mill Tailings Remedial Action (UMTRA) sites. For further information on NABIR Field Research, please contact Mr. Paul Bayer (paul.bayer@ science.doe.gov), the NABIR Field Activities Manager.

NABIR investigators may want to take advantage of the capabilities of the Environmental Molecular Sciences Laboratory (EMSL) at the Pacific Northwest National Laboratory (http://www.emsl.pnl.gov). EMSL provides users with unique and state-of-the-art resources including facilities for high field magnetic resonance, high performance mass spectrometry, interfacial and nanoscale science, molecular science computing, and optical imaging and spectroscopy.

Current Request for Applications

Research projects that address the scientific aims of individual NABIR elements including Biogeochemistry, Biotransformation, Community Dynamics, Biomolecular Science and Engineering, as well as the cross cutting elements Assessment and BASIC are solicited in this announcement. Integrative, interdisciplinary studies that involve research from more than one element are especially encouraged. The focus is on field research, or laboratory studies that can be scaled to the field, to provide supporting information for current or future field research. The NABIR Field Research Center (FRC) provides an opportunity for researchers to work at a DOE site in collaboration with scientists from different research elements. Studies at the NABIR FRC show that microbial reduction of radionuclides and metals is affected by the presence of nitrate and low pH. Thus, research into microbial mechanisms involved in the reduction of radionuclides and metals in this type of subsurface environment is of special interest.

Biogeochemistry: The goal of this element is to understand the fundamental biogeochemical reactions that would lead to long-term immobilization of metal and radionuclide contaminants in the subsurface. The focus is on reactions that govern the concentration, chemical speciation, and distribution of metals and radionuclides between the aqueous and solid phases. Biogeochemical reactions in subsurface environments are influenced by a wide variety of factors, including the availability of electron donors and acceptors, the nature of the microbial community, the chemical species or form of contaminant, the hydrogeology of the site, and the nature of the environmental matrix. Often several competing redox reactions make the prediction of the substrates, products, and kinetics difficult. The biogeochemical reactions are further complicated by the sorption of contaminants and reaction products to mineral surfaces, and the presence of natural organic matter and co-contaminants. The research challenge is to identify and prioritize the *key* biogeochemical reactions that are needed to predict the rate and extent of reactions that result in the immobilization of radionuclides and metals. New and creative scientific approaches are sought that address the following fundamental research questions:

- To *increase immobilization* of radionuclides and metals, what are the principal biogeochemical reactions that govern the concentration, chemical speciation, and distribution of metals and radionuclides between the aqueous and solid phases (with an emphasis on natural geological matrices)? What are the thermodynamic and kinetic controls on these reactions? How do factors such as co-contaminants, sorption processes, and terminal electron acceptors (e.g., nitrate, iron, sulfate), influence these reactions?
- Under what conditions would the contaminants *remobilize*, and what alterations to the environment would increase the long term stability of metals and radionuclides in the subsurface?
- What influence do hydrological processes such as reactive transport, advective/dispersive transport and colloidal transport have on the biological availability, biotransformation, and movement of radionuclides and metals?

Biotransformation: The goal of this element is to understand the mechanisms of microbially mediated transformation of metals and radionuclides in subsurface environments leading to *in situ* immobilization and long term stability. Physiological studies of the biotransformation of metals and radionuclides by subsurface microorganisms will provide the knowledge base needed to understand intrinsic bioremediation and to stimulate biotransformation *in situ*.

DOE subsurface sites encompass a range of redox environments where contaminants such as uranium are present. One challenge is to understand the impact of these environments on microbial physiological processes involved in the biotransformation of radionuclides and metals to an immobilized form. Knowledge of the metabolic pathways for biotransformation of these contaminants by naturally occurring microbial communities in vadose zones, saturated zones and the waste plume is needed. A second challenge is to accelerate the rates of these physiological processes *in situ*, in complex subsurface environments. Biotransformation of metals and radionuclides in the subsurface is poorly understood, and predictive models based on laboratory studies have not always accurately simulated the observed fate of metals and radionuclides in the field. It is important to understand the kinetics of desirable metal and radionuclide biotransformations and the physicochemical factors affecting those kinetics in the field. Research is needed to address questions such as:

- What are the primary metabolic pathways for biotransformation of radionuclides and/or metals by subsurface microorganisms at DOE sites, such as the FRC? Physiological processes studied at the laboratory scale will need to demonstrate how results will be scaled to the field.
- How can metal reduction be harnessed or accelerated to immobilize radionuclides and/or metals in the subsurface? Can *in situ* production of organic acids, chelators, or extracellular polymers affect contaminant mobility?

- What environmental controls affect microbial physiological processes involved in radionuclide and metal biotransformations leading to immobilization in vadose and saturated zones? What factors inhibit these biotransformations *in situ*?
- How can we quantify *in situ* biotransformation kinetics so that these parameters can be applied to numerical models of field scale bioremediation?

Community Dynamics and Microbial Ecology: The goal of this element is to determine the potential for natural microbial communities to immobilize radionuclides and metals. In particular, research focuses on: 1) understanding the structure and function of microbial communities in the subsurface at DOE sites contaminated with metals and radionuclides; and 2) identifying and optimizing the *in situ* growth of microorganisms that transform radionuclides and metals. This research will enhance our ability to predict the effectiveness of intrinsic bioremediation and to optimize microbial community composition for *in situ* immobilization of these contaminants. Diverse microbial communities can be found in subsurface environments. These communities represent an untapped catalytic potential for biotransformation of radionuclides and metals. Most of these microbes, however, are as yet uncultured using current methods. One challenge is to determine if sufficient genotypic and/or phenotypic potential exists to support natural and/or accelerated (biostimulated) bioremediation. Knowledge of microbial community structure and function may ultimately provide the ability to control or stimulate subsurface communities capable of biotransformation of radionuclides and metals. A second challenge is to optimize the community structure and activity for immobilization and metals, and to determine the long term stability of bioremediative communities. Research is needed to address questions such as:

- Is there sufficient biological activity and diversity in subsurface environments to support natural and/or accelerated bioremediation of metals and radionuclides?
- What are the effects of metal and radionuclide contamination on microbial community structure and function, particularly on populations that transform radionuclides and metals? What are the effects of key physical, chemical and hydrological factors on community structure and function, as it relates to immobilization of metals and radionuclides?
- What is the role of consortial interactions in subsurface environments contaminated with radionuclides and metals? Such interactions might include competition for electron donors and acceptors, or consortial interactions in the biotransformation of metals and radionuclides.
- What is the potential importance of gene transfer in natural microbial communities at subsurface sites contaminated with radionuclides or metals?

Those studies that link structure to function of microbial communities that immobilize metals and/or radionuclides at DOE sites are especially encouraged.

Biomolecular Science and Engineering: Research in this element provides a knowledge base, at the biomolecular level, of the processes leading to the *in situ* immobilization of radionuclides and metals by indigenous subsurface microorganisms. The primary goal of this element is to understand the genetic, biochemical, and regulatory processes that mediate biotransformation of these specific radionuclides and metals, leading to their immobilization. Characterization of genes, gene products, and genetic regulatory networks associated with these biotransformations is key to this understanding. Detailed studies of the enzymatic mechanisms for reduction of radionuclides and/or metals are needed to increase our understanding of *in situ* processes and to identify gene targets for better molecular assessment of radionuclide and metal reduction. Secondary goals include: 1) understanding molecular mechanisms of resistance of subsurface microorganisms to radionuclide and metal toxicity; 2) understanding, at a molecular level, the processes of lateral transfer between microbes of genes involved in biotransformation of these radionuclides and metals; 3) developing novel technologies to provide insights into biomolecular mechanisms of metal and radionuclide biotransformation; and 4) developing approaches to manipulate pathways and enzyme systems that mediate these biotransformations .

DOE subsurface sites encompass a wide range of environments with a diversity of microbial communities and contaminants. One of the challenges of the Biomolecular Science and Engineering Element is to select microbes for studies that are active members of subsurface microbial communities. A second challenge is to extrapolate laboratory findings on pure cultures under laboratory conditions to complex *in situ* environmental conditions. This extrapolation is especially critical in studying gene expression, which may be modified by changes in local cellular environments in the subsurface. A third challenge is to take advantage of genomic and other data derived from the DOE Microbial Genome Program (http://www.ornl.gov/microbialgenomes) on subsurface microorganisms to increase our understanding of how genes relevant to bioremediation are expressed in the environment. Research is needed to address questions such as:

- How are genes regulated in subsurface microorganisms that are responsible for biotransformation and immobilization of radionuclides and metals? How are genes regulated in these microorganisms to promote survival in the presence of potentially toxic levels of these contaminants?
- What are the effects of key environmental parameters on regulation and expression of genes involved in metal/radionuclide reduction? For example, how do pH and co-contaminants such as nitrate impact the biochemistry and gene expression and regulation of uranium and technetium reduction?
- What are the basic biomolecular mechanisms of uranium and technetium reduction and reoxidation in microorganisms, primarily those indigenous to the subsurface? How can biomolecular processes be manipulated to enhance the sustainability of immobilization of uranium, technetium or chromium? Are there novel biomolecular mechanisms that can be used to immobilize mercury or plutonium?
- What are the biomolecular mechanisms involved in lateral transfer of metal/radionlucide reduction genes in subsurface microbial communities?

Applications should primarily focus on indigenous subsurface microorganisms that can precipitate and immobilize these radionuclides and metals. The ultimate goal of this element is to improve our ability to predict and manipulate the activities of microbes *in situ*, particularly in an *in situ* immobilization scenario.

Assessment**:** Assessment is a cross-cutting element with a goal to develop innovative methods to assess processes and endpoints in support of the NABIR Science Elements. Thus, assessment projects are being sought that support the Science Elements of Biogeochemistry, Biotransformation, Community Dynamics/Microbial Ecology, and Biomolecular Science and Engineering. Methods may range from molecular to field scale, but they should improve the understanding of *in situ* bioremediation processes in subsurface environments contaminated with radionuclides and metals. Priority will be given to research applications that could lead to fieldable, cost-effective, real time assessment techniques and/or instrumentation. NABIR will not fund projects that examine endpoints relating to human health risks. Research should address the development of innovative and effective methods for assessing or quantifying:

- Biogeochemical or biotransformation processes and rates, and microbial community structure and function relative to bioremediation of metals and radionuclides.
- Bioremediation end points, in particular, the concentration, speciation and stability of radionuclide and metal contaminants.

Techniques must enable NABIR science and address specific science needs of the program. The applicant should explain the potential impact and contribution to the NABIR program, as well as the relevance and potential usefulness of the innovation.

Bioremediation and its Societal Implications and Concerns (BASIC): The objective of this element is to identify and explore societal issues associated with NABIR. BASIC is designed to provide information on issues that might influence the implementation of NABIR science and to involve NABIR scientists in discussions about the societal implication of their research. The BASIC program may also provide an avenue to identify key issues and sensitivities involved in bioremediation strategies, such as immobilization of metals and radionuclides *in situ* as a means of long-term stewardship.

Major focus areas for BASIC research include 1) Identifying and prioritizing societal and regulatory issues associated with bioremediation of metals and radionuclides in subsurface environments, particularly strategies that entail immobilization in place; 2) fostering collaboration between NABIR scientists and site stakeholders and 3) enhancing the understanding and communication of NABIR research to stakeholder communities and others. Quantitative approaches and integration with other NABIR program elements are strongly encouraged. BASIC grants will not extend beyond two years beyond the award date. All grant applications should provide a plan for evaluation of progress or outcomes. Where a product (guidelines, recommendations, documents, etc.) is the result, dissemination plans including timelines must be discussed.

The NABIR program also encourages smaller grant applications (up to $35,000 total costs) for innovative and exploratory activities within the BASIC area. Such exploratory grants could be used to carry out pilot investigative research on an issue consistent with any of the above areas of BASIC research, support a sabbatical leave to organize and hold a conference, or to initiate start-up studies that could generate preliminary data for a subsequent grant application. Such small grant applications must use the standard DOE application forms procedures outlined below, but should have a narrative section no more than five pages. These small grants, which will be peer reviewed, will not extend beyond one year from the award date.

Integrative Studies

This solicitation especially encourages those studies that integrate research from more than one NABIR research element through laboratory and/or field research. This interdisciplinary research should focus on achieving the primary goals of the NABIR program through collaborative studies in which the experimental design integrates two or more NABIR elements. Interdisciplinary teams may include participation from two or more research areas that might include: microbiology, geochemistry, hydrology, environmental engineering, numerical modeling or other disciplines. Partnering with specific field experiments may provide information for hypothesis testing. Such integrative studies might include, for example:

- Employing numerical modeling to integrate information from more than one element, such as Biogeochemistry, Biotransformation, and Community Dynamics and Microbial Ecology, to better predict *in situ* immobilization of metals and radionuclides
- Studies of the effects of key physical, geochemical and hydrological parameters on the structure and function of subsurface microbial communities engaged in metal/radionuclide biotransformation and immobilization
- Integration of new methods in the Assessment element with actual application to studies of biotransformation or biogeochemistry of radionuclide/metal reduction and precipitation
- Linking chemical speciation of radionuclides and metals in subsurface environments to the bioavailability of those contaminants to microorganisms
- Studies on the changes of subsurface microbial community structure and function, and the effect on net rates of biotransformation during biostimulation experiments
- Partnership between any of the Science Elements and research in BASIC

Additional Information for Applications

It is anticipated that up to $3 million will be available for multiple awards to be made in late Fiscal Year 2003 and early Fiscal Year 2004 in the categories described above, contingent on availability of appropriated funds. An additional sum, up to $3 million, will be available for competition by DOE National Laboratories under a separate solicitation (LAB 03-13). Applications for all elements except for BASIC may request project support up to three years, with out-year support contingent on availability of funds, progress of the research and programmatic needs. Applications for BASIC may request support for two years, or one year for exploratory activities. Annual budgets for projects are expected to range from $100,000 to $300,000 total costs. Annual budgets for integrative studies involving participants representing more than one research element may range up to $450,000. All applications should include letters of agreement to collaborate from potential collaborators; these letters should specify the contributions the collaborators intend to make if the application is accepted and funded. DOE may encourage collaboration among prospective investigators to promote joint applications or joint research projects by using information obtained through the preliminary applications or through other forms of communication.

Merit Review

Applications will be subjected to formal merit review (peer review) and will be evaluated against the following evaluation criteria which are listed in descending order of importance codified at 10 CFR 605.10(d):

1. Scientific and/or Technical Merit of the Project;
2. Appropriateness of the Proposed Method or Approach;
3. Competency of Applicant's personnel and Adequacy of Proposed Resources;
4. Reasonableness and Appropriateness of the Proposed Budget.

For renewals, progress on previous NABIR funded research will be an important criterion for evaluation. As part of the evaluation, program policy factors also become a selection priority. Note, external peer reviewers are selected with regard to both their scientific expertise and the absence of conflict-of-interest issues. Federal and non-federal reviewers will be used, and submission of an application constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

Submission Information

Information about the development, submission of applications, eligibility, limitations, evaluation, the selection process, and other policies and procedures may be found in 10 CFR Part 605, and in the Application Guide for the Office of Science Financial Assistance Program. Electronic access to SC's Financial Assistance Application Guide is possible via the World Wide Web at: http://www.sc.doe.gov/production/grants/grants.html. DOE is under no obligation to pay for any costs associated with the preparation or submission of applications if an award is not made. In addition, for this notice, the research description must be 20 pages or less, exclusive of attachments, and must contain an abstract or summary of the proposed research (to include the hypotheses being tested, the proposed experimental design, and the names of all investigators and their affiliations). Applicants who have had prior NABIR support must include a Progress Section with a brief description of results and a list of publications derived from that funding. Attachments should include short (2 pages) curriculum vitae, QA/QC plan, a listing of all current and pending federal support and letters of intent when collaborations are part of the proposed research. Curriculum vitae should be submitted in a form similar to that of NIH or NSF (two to three pages).

The Office of Science as part of its grant regulations requires at 10 CFR 605.11(b) that a recipient receiving a grant and performing research involving recombinant DNA molecules and/or organisms and viruses containing recombinant DNA molecules shall comply with the National Institutes of Health (NIH) "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.

Grantees must also comply with other federal and state laws and regulations as appropriate; for example, the Toxic Substances Control Act (TSCA) as it applies to genetically modified organisms. Although compliance with NEPA is the responsibility of DOE, grantees proposing to conduct field research are expected to provide information necessary for the DOE to complete the NEPA review and documentation.

Additional information on the NABIR Program is available at the following web site: http://www.lbl.gov/NABIR/. For researchers who do not have access to the world wide web, please contact Karen Carlson; Environmental Sciences Division, SC-74/Germantown Building; U.S. Department of Energy; 1000 Independence Avenue, S.W., Washington, D.C. 20585-1290; phone: (301) 903-3338; fax: (301) 903-8519; E-mail: karen.carlson@science.doe.gov; for hard copies of background material mentioned in this solicitation.

The Catalog of Federal Domestic Assistance Number for this program is 81.049, and the solicitation control number is ERFAP 10 CFR Part 605.

John Rodney Clark
Associate Director of Science
for Resource Management

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