Office of Science
Financial Assistance
Funding Opportunity Announcement
DE-FOA-0000311

Subsurface Biogeochemical Research (Previously Environmental Remediation Science Program)

SUMMARY:

The Office of Science (SC), U.S. Department of Energy (DOE), hereby announces interest in receiving applications for research grants for Subsurface Biogeochemical Research (SBR), which is within the Climate and Environmental Sciences Division (CESD) in the Office of Biological and Environmental Research (BER). SBR seeks to advance fundamental science towards solutions to key DOE environmental challenges including carbon sequestration, contamination from past nuclear weapons production and a scientific basis for the long term stewardship of nuclear waste disposal. The activity supports an integrated portfolio of research ranging from molecular to field scales with emphasis on the use of advanced computer models and multidisciplinary, iterative experimentation to understand and predict contaminant transport in complex subsurface environments. This mission is guided by the **BER long term performance measure** to *"provide sufficient scientific understanding such that DOE sites would be able to incorporate coupled physical, chemical and biological processes into decision making for environmental remediation and long-term stewardship."* To meet this measure, BER funds basic research to investigate the key processes affecting the mobility of subsurface contaminants found at DOE sites. The goal of this FOA is to support innovative, fundamental research investigating the coupled physical, chemical, and biological processes affecting the transport of subsurface contaminants at DOE sites. Applications should identify critical knowledge gaps and address hypothesis-driven research to better understand the significant physical, chemical, and biological processes influencing the form and mobility of DOE contaminants in the subsurface. Research projects should aim to provide the scientific basis for the long term stewardship of contaminated sites across the DOE complex and the development of new remediation concepts and strategies. **Applications must address the applicability of the proposed research to understanding DOE relevant, field-scale, contaminant transport processes by including an explanation of how the proposed effort will support the accomplishment of the BER long term performance measure.** The environment of interest is the terrestrial subsurface including the vadose zone, the saturated zone and key groundwater-surface water interfaces. The specific radionuclide and heavy metal contaminants and the general science needs for this FOA are outlined in the **Supplementary Information** section below. Phytoremediation and the study of organic contaminants are NOT addressed in this FOA.

PREAPPLICATIONS

Potential applicants are **strongly encouraged** to submit a brief preapplication, referencing DE-FOA-0000311 for receipt by DOE by **4:30 p.m., Eastern Time, April 29, 2010.** Preapplications are limited to three pages total, including a prescribed cover page. The cover page should include: the project title, the Lead PI's name and complete contact information, whether a Full or Exploratory Application is anticipated, and a table listing the Lead PI and institution and all funded Co-PIs, and their institutions and the approximate amount of funding requested for each year for the project for each funded investigator. The template for the required cover page should be downloaded from http://www.lbl.gov/ERSP/generalinfo/proposalcalls.html.

Preapplications should be sent individually as a single PDF file attachment via email to: **Todd.Anderson@science.doe.gov. The subject line of the email must state: "SBR Preapplication to DE-FOA-0000311 - [Full or Exploratory]". Preapplications must be received by DOE by 4:30 PM, Eastern Time, April 29, 2010.** No FAX or mail submission of preapplications will be accepted. Preapplications will be reviewed for conformance with the guidelines presented in this FOA and suitability in the technical areas specified in this FOA. A response to the preapplications encouraging or discouraging formal applications will be communicated to the applicants by May 27, 2010. Applicants who have not received a response regarding the status of their preapplication by this date are responsible for contacting the program office to confirm the status of their preapplications.

Preapplications should describe the research objectives, the technical approach(s), and the proposed team members and their expertise. The intent in requesting a preapplication is to save the time and effort of applicants in preparing and submitting a formal project application that may be inappropriate for the program. Preapplications will be reviewed relative to the scope and research needs as outlined in this FOA and outlined in the SBR Strategic Plan (at http://www.sc.doe.gov/ober/ERSD/ERSD_2007_Strategic_Plan.pdf). Biographical data are not required for preapplications, nor is an institutional endorsement necessary.

APPLICATION DUE DATE: July 15, 2010, 11:59 p.m. Eastern Time

Formal applications submitted in response to this FOA must be received by July 15, 2010, 11:59 p.m. Eastern time, to permit timely consideration of awards. **APPLICATIONS RECEIVED AFTER THE DEADLINE WILL NOT BE REVIEWED OR CONSIDERED FOR AWARD.**

IMPORTANT SUBMISSION INFORMATION:

The full text of the Funding Opportunity Announcement (FOA) is located on FedConnect. Instructions for completing the Grant Application Package are contained in the full text of the FOA which can be obtained at: https://www.fedconnect.net/FedConnect/?doc=DE-FOA-0000311&agency=DOE. To search for the FOA in FedConnect click on "Search Public Opportunities". Under "Search Criteria", select "Advanced Options", enter a portion of the title "Subsurface Biogeochemical Research", then click on "Search". Once the screen comes up, locate the appropriate Announcement.

In order to be considered for award, Applicants must follow the instructions contained in the Funding Opportunity Announcement.

WHERE TO SUBMIT: Applications must be submitted through Grants.gov to be considered for award.

You cannot submit an application through Grants.gov unless you are registered. Please read the registration requirements carefully and start the process immediately. Remember you have to update your CCR registration annually. If you have any questions about your registration, you should contact the Grants.gov Helpdesk at 1-800-518-4726 to verify that you are still registered in Grants.gov.

Registration Requirements: There are several one-time actions you must complete in order to submit an application through Grants.gov (e.g., obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number, register with the Central Contract Registry (CCR), register with the credential provider, and register with Grants.gov). See http://www.grants.gov/GetStarted. Use the Grants.gov Organization Registration Checklist at http://www.grants.gov/assets/OrganizationRegCheck.pdf to guide you through the process. Designating an E-Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in the CCR registration process. Applicants, who are not registered with CCR and Grants.gov, should allow at least 21 days to complete these requirements. It is suggested that the process be started as soon as possible.

IMPORTANT NOTICE TO POTENTIAL APPLICANTS:
When you have completed the process, you should call the Grants.gov Helpdesk at 1-800-518-4726 to verify that you have completed the final step (i.e. Grants.gov registration).

Questions: Questions relating to the registration process, system requirements, how an application form works, or the submittal process must be directed to Grants.gov at 1-800-518-4726 or support@grants.gov. Part VII of the FOA explains how to submit other questions to the Department of Energy (DOE).

GENERAL INQUIRIES ABOUT THIS FOA SHOULD BE DIRECTED TO:

Technical/Scientific Program Contact:

Program Manager: Dr. Robert (Todd) Anderson
U. S. Department of Energy
Office of Biological and Environmental Research
Telephone: (301) 903-5549
E-mail: Todd.Anderson@science.doe.gov

SUPPLEMENTARY INFORMATION:

The DOE oversees some of the largest environmental cleanup operations in the world. Cold War Era processing of uranium for nuclear power and weapons has left an enduring legacy of over 6 billion cubic meters of contaminated soil and groundwater. Innovative solutions, based on

scientific understanding of subsurface processes, are needed to remediate, manage and monitor the various contaminated sites found across the DOE complex (NRC, 2000). The cleanup of contaminated sites across the DOE complex presents an enormous technical, scientific and financial challenge for the DOE and the nation as a whole. While technologies exist for dismantling and decommissioning surface structures such as contaminated buildings, contaminants that have entered the subsurface are exceptionally difficult to clean up. This is particularly true for those contaminants that are spread over wide areas and whose potent toxicity and persistence require removal to very low levels. Radionuclides, which are products of nuclear fuel and weapons manufacturing, are of particular concern to DOE cleanup operations at DOE sites in addition to heavy metals and non-aqueous phase liquids (NAPLs). This FOA targets a subset of these contaminants listed below under the **Contaminants of Concern** section of the FOA. At this time, we are **NOT** soliciting research projects that focus on NAPL contaminants.

The projected performance of long-term stewardship strategies and subsurface remediation techniques is often based on insufficient knowledge of the transport behavior of contaminants in the subsurface across key groundwater-surface water interfaces and the mechanisms of contaminant transformation. As a result, predictions of long-term contaminant mobility often prove to be inaccurate and in situ cleanup strategies often do not meet performance expectations, exceeding both cost and time schedule estimates. At many sites, it is likely that subsurface contamination will remain long after surface remediation measures have been completed (DOE, 2001; NRC, 2000). It is therefore imperative that the DOE understand the factors that affect contaminant mobility and transformation within the subsurface and across key groundwater-surface water interfaces to devise new remediation and long-term monitoring strategies and to provide realistic assessments of the threat posed by subsurface contamination. These tasks will require significant advances in our understanding of the key factors controlling the mobility and fate of contaminants.

The SBR portfolio maintains a diverse suite of projects ranging from molecular-scale science to field-scale investigations. The ultimate goal of SBR is to provide the DOE with improved predictions of subsurface processes affecting contaminant transport or transformation. One of the more significant challenges is to link field-scale observations of contaminant mobility with key mechanisms controlling contaminant availability, reactivity and transport at smaller scales.

SBR projects should progress toward demonstrating the field relevance of processes or techniques under investigation. To promote this approach, the SBR activity is soliciting integrative and/or multidisciplinary research applications addressing the investigation of contaminants of greatest concern to the DOE. This is not meant to preclude single investigator projects of strong DOE environmental relevance.

The preceding discussion is based on the SBR Strategic Plan which is available on the SBR website at: http://www.sc.doe.gov/ober/ERSD/ERSD_2007_Strategic_Plan.pdf.

Additional information on approaches to understanding DOE's contamination issues are detailed in a recent (Aug 2009) workshop report on "Complex Systems Science for Subsurface Fate and Transport" which can be found at http://www.sc.doe.gov/ober/subsurfacecomplexity_03-05-10.pdf

Contaminants of Concern

Key contaminants (and their mixtures) of interest for this FOA are:

- Radionuclides: uranium, technetium-99, strontium-90, plutonium, cesium-137, iodine-129, and neptunium-237.
- Non-Radioactive Metals: mercury and chromium(VI)
- Nitrate and complexing agents as co-contaminants with the listed radionuclides or non-radioactive metals.

NAPL contaminants are NOT a focus for this FOA. Applications addressing NAPL or organic contaminant will not be considered at this time.

Descriptions of the nature and extent of contamination at the principal DOE sites are available at http://emdev.apps.em.doe.gov/emdev/pdfs/Groundwater_Booklet-2008.pdf and http://www.nap.edu/books/0309065496/html/index.html/.

More detailed information is available in some cases from the major DOE sites:

- Hanford (http://www.hanford.gov)
- Idaho National Laboratory (http://www.inl.gov/subsurface/environmentalissues/vadosezone.shtml)
- Oak Ridge Reservation (http://www.oro.doe.gov/external/Programs/EnvironmentalManagement/tabid/42/Default.aspx) and
- Savannah River Site (http://www.srs.gov/general/srs-home.html, http://www.srs.gov/general/programs/soil/extpage.html

Research Applications: Full and Exploratory

Applications submitted in response to this FOA should address the basic science needs for SBR outlined in the section below entitled **Science Needs**, and should address at least one of the contaminants of interest. Applications must identify whether the application is a **Full Application** or an **Exploratory Application** as defined below. Both single investigator projects and multi-investigator projects are encouraged. Multi-investigator projects are expected to integrate the efforts of a multi-disciplinary team to tackle problems that cannot be effectively addressed by a single investigator. All projects should clearly delineate an integrative, hypothesis-driven research approach and describe how the results of the research would ultimately improve the understanding of processes affecting the mobility of contaminants at the field scale in the context of the DOE cleanup mission.

A small but critical element of the SBR portfolio is the development of enabling scientific tools for characterizing the spatial and temporal evolution of complex subsurface systems. Applicants proposing to develop enabling scientific tools for subsurface science should clearly indicate this in the Executive Summary. Applications to develop enabling scientific tools are NOT required to motivate the proposed research with specific hypotheses; however, these applications MUST justify both the novelty and technical merit of the proposed scientific tools as well as explain the

potential to improve the understanding of subsurface processes and the monitoring of contaminated sites.

The intent of the Exploratory Research component of SBR is to catalyze the study of new concepts, tools and approaches that could lead to breakthroughs in subsurface remediation science as well as to broaden the pool of researchers in SBR. Eligible areas include the SBR science needs described below. Exploratory Applications will have shorter duration and less funding than Full Applications. These projects are intended to provide opportunities to conduct preliminary research and to develop novel ideas for later, more substantial funding opportunities within SBR (i.e., Full Applications). Exploratory Applications should address topics that could lead to breakthroughs in one or more of the science areas in the program and align with the SBR focus on processes occurring in the subsurface including the vadose zone, the saturated zone and key groundwater-surface water interfaces. The contaminants of interest for this FOA are the same as those listed above in the **Contaminants of Concern** section.

Both Full and Exploratory Applications are intended to fill critical knowledge gaps, including the exploration of some high-risk approaches. BER encourages the submission of innovative "high-risk" applications with potential for future high impact on subsurface processes affecting contaminant transport. The probability of success and the risk-reward balance will be considered when making funding decisions.

Science Needs

SBR seeks to develop a fundamental and quantitative understanding of the physical, chemical and biological processes affecting contaminant transport in the subsurface and at key groundwater-surface water interfaces at DOE sites. Critical to this objective is a better understanding of how these coupled processes affect contaminant mobility, reactivity and stability in subsurface environments.

Understanding contaminant transport at the field scale is limited by our current, inadequate understanding of the physical, chemical and biological factors that control contaminant mobility. Methods to characterize subsurface structures and the physical, chemical and biological properties affecting contaminant transport over a wide range of scales are crucial to providing more realistic conceptual models of contaminant transport. Geophysical and hydrogeologic methods to measure important subsurface structural and/or transport parameters are of interest to SBR as well as methods to detect and track temporal geochemical and biogeochemical changes in subsurface environments. Of particular interest are novel methods or techniques that directly impact conceptual and/or quantitative model development of contaminant mobility.

Many chemical and geochemical factors affect the transport and transformation of contaminants found in subsurface environments. Often several competing processes occur simultaneously complicating an overall quantitative description of contaminant mobility. At many DOE sites, DOE-relevant contaminants are found under unusual conditions of pH, ionic strength and redox potential, and in unusual mixtures or mineral forms not previously described. Additionally, various in situ remediation techniques produce changes in local geochemical conditions in groundwater or vadose zone settings that directly influence contaminant mobility. SBR seeks to

develop the understanding of the key chemical and geochemical interactions that have a quantitatively important effect on contaminant transport in subsurface environments and the tools to detect and measure these processes. This requires the identification and prioritization of the essential processes needed to predict the extent and rate of reactions affecting contaminant transport at DOE sites. Insight gained at the molecular scale should be used to interpret or predict processes occurring at larger scales and ultimately along groundwater flowpaths in the subsurface. Refinement of conceptual and computational models of contaminant transport based on new geochemical understanding of contaminant mobility and insight of processes at the microbe-mineral interface is also of interest.

Microorganisms detected in the subsurface can profoundly alter geochemical conditions along groundwater flowpaths. In addition to indirectly creating conditions hindering contaminant mobility, many microorganisms are known to enzymatically transform metal and radionuclide contaminants to innocuous or immobile forms. This is the basis for several in situ bioremediation technologies and natural attenuation mechanisms for contaminant metals and radionuclides. However, the sustained manipulation of subsurface microbial communities to affect contaminant transport and/or degradation is still largely an empirical exercise. Likewise, the microbially-mediated mechanisms of natural attenuation processes remain poorly understood. Much remains to be learned about the functioning of active subsurface microbial communities involved in contaminant biotransformation processes. Of particular concern to SBR activity is a predictive understanding of how microbial growth and activity relate to mineral and contaminant biotransformation. This requires detailed study of the physiology of environmentally relevant organisms with a potential to interact with metal and radionuclide contaminants coupled with iterative studies in situ to understand the metabolism of these organisms in the environment. The SBR activity seeks a holistic understanding of how microorganisms access/obtain essential nutrients, electron donors and electron acceptors in order to sustain activity in situ. The SBR activity is particularly interested in the coupling of genome-enabled science with environmental perturbation and/or bioremediation studies and modeling to provide a more mechanistic understanding of microbial metabolism in subsurface environments. Likewise the SBR activity is interested in the tools to measure and monitor this activity in situ. Also, since microorganisms rarely exist as single microbes in the environment, techniques to track changes in the active microbial community are needed to better understand competitive processes and shifts in microbial community structure that could impact contaminant mobility. Iterative studies coupling laboratory investigation with environmental studies and modeling is the hypothesis-generating engine the SBR activity seeks to promote to advance a predictive understanding of microbial activity in subsurface environments. SBR efforts in microbiological and biogeochemical science should progress towards mechanistic and predictive descriptions of microbial activity in ways that can be computationally integrated with geochemical and hydrologic predictions of environmental processes. The SBR activity ultimately seeks to understand microbial activity in the proper hydrobiogeochemical context found in subsurface environments.

The emphasis of SBR is on an integrative understanding of the relationships among the coupled physical, chemical and biological processes influencing the transport and/or remediation of contaminants at DOE sites. Applications submitted to SBR need not necessarily incorporate an investigation of all three processes for situations where contaminant transport is dominated

unequally by one process or another, but should describe the rationale for the overall focus of the research. These science needs are inherently multidisciplinary, but do not preclude single investigator projects of strong DOE environmental relevance. Coordination with an SBR field project is encouraged where appropriate but not required. The contaminants of interest for this FOA are listed above in the **Contaminants of Concern** section.

The following is a list of example areas of interest for this FOA. This list is intended to illustrate, but not necessarily constrain research to these selected areas:

Molecular Scale Processes

- Advanced techniques to assess the form, stability and distribution of immobilized DOE relevant subsurface contaminants.
- Understanding the formation/nucleation, thermodynamic stability, transport characteristics, and sorptive capacity of nanoparticulate/colloid materials associated with natural or induced gradients relevant to contaminated DOE field sites.
- New techniques for quantifying geochemical and/or biochemical mechanisms affecting contaminant transport and sustained immobilization. Iterative studies between the laboratory and the environment to understand the role of these mechanisms in situ.
- Quantitative techniques to measure the distribution and contaminant sorption characteristics of minerals in natural materials.

Intermediate Scale Processes

- High throughput techniques to recover and characterize new active microbial isolates and/or communities impacting contaminant mobility from contaminated subsurface environments and/or biostimulated field plots. Projects should seek to develop environmentally relevant model organisms and/or communities that can be iteratively studied in the laboratory and in the environment.
- Iterative genome-enabled studies of environmentally relevant (subsurface) microorganisms that link laboratory-derived studies of physiology/metabolism with in situ contaminant biotransformation and/or immobilization activity via modeling. Laboratory studies coupled with environmental perturbation studies are encouraged.
- Approaches to track and model the composition, activity and/or metabolism of active microbial communities impacting contaminant transport to understand microbial competitive processes and/or spatial and temporal shifts in microbial community structure in subsurface environments. Iterative laboratory and environmental perturbation studies are encouraged.
- Techniques to understand the key hydrogeological and biogeochemical factors that govern the distribution and functioning of microbial communities in subsurface environments.
- Improved representation of microbial activity (including genome-enabled approaches), sorption, mineralization dynamics, and scaling within reactive transport models as needed to improve subsurface contaminant fate and transport predictions.

- Scaling of biogeochemical reactions and gradients, important for understanding the fate and transport of DOE relevant contaminants in the subsurface, occurring at the molecular, mineral surface and pore levels to larger scales.
- Quantitative techniques for monitoring biogeochemical transformations associated with natural or induced gradients and for assessing their impact on flow characteristics from the pore to field scales.

Field Scale Processes

- Quantification of scale-dependent hydrobiogeochemical factors that govern plume migration, remediation efficacy, and aquifer natural attenuation capacity.
- Methods to integrate information about subsurface hydrobiogeochemical mechanisms and properties across scales.
- Geophysical and hydrogeological techniques for characterizing properties that control groundwater flow and transport.
- Sensors for evaluating redox, chemical gradients and, mineral or contamination speciation at crucial biogeochemical interfaces.

Studies requiring metagenomic or other genome sequencing analyses are encouraged to seek support via the community sequencing program at the Joint Genome Institute. Projects seeking alternative sequencing support to meet project sequencing needs will need to budget accordingly.

Related Programs

The SBR activity strongly encourages investigators to familiarize themselves with the resources and potential partnering opportunities provided within SBR. The SBR activity funds basic research on subsurface contaminant transport and remediation processes ranging from molecular-scale processes to field-scale processes via a unique set of program resources and partnering -- leveraging of these resources is strongly encouraged. Applicants should familiarize themselves with the following resources and potential partnering opportunities provided by the SBR activity.

The SBR activity initiated three large multidisciplinary field-scale research projects at three different sites beginning in FY 2007. The Integrated Field-Scale Subsurface Research Challenges (IFRCs) at Oak Ridge, Tennessee and Rifle, Colorado, represent a new format for directed research that continues ongoing subsurface science at these sites. The IFRC at the Hanford site, Washington, provides a framework for a focused, integrated research effort at the Hanford 300 Area. In addition, the SBR activity supports a project at the Hanford 100H area to perform field investigations to assess the potential for immobilizing and detoxifying chromium-contaminated soils and groundwater using bioremediation. These sites are an important component of SBR-funded research that enable the testing of laboratory-derived hypotheses under natural conditions at the field scale. The sites also provide SBR investigators with opportunities to obtain samples of environmental media for experimental purposes, or opportunities to conduct short-term field experiments. Applicants interested in using these resources must contact the respective Lead Scientist and must include a letter of support from the Lead Scientist in the full application. Programmatic and contact information for these projects can found at: http://www.lbl.gov/ERSP/generalinfo/field_scale.html.

The SBR activity supports focused research programs at seven DOE National Laboratories and a diverse portfolio of research projects led by University PIs. The SBR activity supports multi-disciplinary and integrated research programs at the following National Laboratories through BER's SBR Scientific Focus Area (SFA) Programs (http://www.lbl.gov/ERSP/generalinfo/sfa.html): Argonne National Laboratory, Idaho National Laboratory, Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, and the SLAC National Accelerator Laboratory. University-led research projects for the SBR activity are selected and funded through this annual FOA. All SBR PIs and key Co-PIs are required to attend the annual SBR Principal Investigator's Meeting. The slides of oral presentations as well as abstracts for all currently funded SBR projects are available at the SBR PI's Meeting web site (http://www.lbl.gov/ERSP/generalinfo/PI_ann_mtgs.html).

Programmatic resources also include the Environmental Molecular Science Laboratory (EMSL, http://www.emsl.pnl.gov/emslweb/) located at the Pacific Northwest National Laboratory. EMSL is a National Scientific User Facility that supports an array of co-located experimental and computational capabilities for molecular-level research that are made available to the scientific community. Investigators are strongly encouraged to consider EMSL capabilities in developing applications.

Biological processes profoundly influence contaminant transport at a variety of scales in the subsurface. The SBR activity maintains a close relationship with the Genomic Sciences program (http://genomicscience.energy.gov/) and the microbial genome sequencing efforts at the Joint Genome Institute (JGI, http://www.jgi.doe.gov/) in order to take advantage of revolutionary genome-enabled and systems biology techniques that promise a more mechanistic understanding of subsurface microbial metabolism affecting contaminant transport.

DOE's substantial computational resources are now being applied to simulations of subsurface reactive transport through SBR participation in the SciDAC (Scientific Discovery through Advanced Computing, http://www.osti.gov/scidac/) program. The SciDAC program funds computationally intensive research on fundamental science questions using some of the world's most powerful computers. SBR in conjunction with DOE's Office of Advanced Scientific Computing are supporting the following two SciDAC projects (http://www.lbl.gov/ERSP/generalinfo/modeling.html): "Modeling Multiscale-Multiphase-Multicomponent Subsurface Reactive Flows using Advanced Computing" and "Hybrid Numerical Methods for Multiscale Simulations of Subsurface Biogeochemical Processes".

Collaboration

Multi-disciplinary and inter-institutional collaborations are strongly encouraged to enhance and strengthen research capabilities as needed. Collaboration could include institutions such as universities, industry, non-profit organizations, federal agencies and Federally Funded Research and Development Centers (FFRDCs). All collaborative applications should include letters of agreement from each collaborator who would receive funding. These letters should specify the contributions the collaborators intend to make if the application is accepted and funded. Applications for multi-investigator projects should present a management structure for

integrating collaborating investigators. Involvement of students and post doctoral scientists is encouraged. Refer to http://www.science.doe.gov/grants/Colab.htm for details.

Availability of User Facilities and Other Specialized Resources

The Department of Energy has responsibility for programs and facilities that offer unique and complementary resources that support subsurface biogeochemical research. Potential applicants are encouraged to consider use of these programs/facilities in developing their applications.

- The Environmental Molecular Science Laboratory (EMSL) at the Pacific Northwest National Laboratory (http://www.emsl.pnl.gov/emslweb/), provides users with a suite of nuclear magnetic resonance (NMR) spectrometers, including a 900 MHz NMR, that can be used to probe the structure of contaminant/mineral interactions; a suite of mass spectrometers, including an 11.5 Tesla system, and data analysis software for proteomics studies of microbes and microbial communities; ultra-high vacuum scanning, tunneling and cryogenic electron and atomic force microscopes for imaging and probing cellular and mineral structures; multi-scale mineral and material structure characterization tools; and other experimental resources for microbial dynamics and visualization studies, as well as surface dynamics and interfacial studies.
- The EMSL's 160 TeraFlop high performance supercomputer is available for computational research in the physical, chemical and biological sciences, including geochemistry, groundwater flow and transport simulations, molecular thermodynamics and kinetics, heavy element chemistry, geochemistry, and surface chemistry (http://www.emsl.pnl.gov/capabs/mscf.shtml). Remote and on-site access to the system and associated software, and visualization and data storage capabilities are available through a separate application and external peer review process.
- DOE also provides compute cycles to the scientific user community at other high performance computing centers, including the National Energy Research Scientific Computing Center (NERSC) at the Lawrence Berkeley National Laboratory (http://www.nersc.gov), and the National Center for Computational Sciences (NCCS) at the Oak Ridge National Laboratory (http://nccs.gov/).
- The Joint Genome Institute (JGI) in Walnut Creek, California unites the expertise of the Lawrence Berkeley, Lawrence Livermore, Los Alamos, Oak Ridge, and Pacific Northwest National Laboratories, along with the HudsonAlpha Institute for Biotechnology to advance genomics in support of the DOE missions related to clean energy generation and environmental remediation. Through its Community Sequencing Program (CSP), the JGI solicits proposals related to the DOE missions of bioenergy, global carbon cycling and biogeochemical processes influencing contaminant transport. Targets include bacterial and archaeal isolates, large-scale eukaryotic or bacterial resequencing efforts that exploit next-generation sequencing technologies, eukaryotic reference genomes, and environmental microbial genomes (metagenomes). Letters of intent to the CSP are not required, and proposals are accepted on a continuous basis. Proposals for bacterial and archaeal isolates will be reviewed every three months **(review schedule 2/5/10, 5/7/10, 8/6/10, 11/5/10). Deadline for submission is 30 days prior to the review date. More information can be found at** http://www.jgi.doe.gov/programs/index.html). Projects seeking alternative sequencing

support at other sequencing centers to meet project needs will need to budget accordingly.

- The SBR activity provides user support for experiments at synchrotron light sources that are capable of providing structural and chemical information often unavailable with conventional sources of x-rays. DOE laboratories with synchrotrons supporting SBR and points of contact include: Argonne National Laboratory (http://www.aps.anl.gov/), contact Ken Kemner (kemner@anl.gov); Lawrence Berkeley National Laboratory (http://esd.lbl.gov/als_environmental_program/), contact Susan Hubbard (sshubbard@lbl.gov); and Stanford Synchrotron Radiation Laboratory (http://www-ssrl.slac.stanford.edu/mes/remedi/index.html), contact John Bargar, (bargar@slac.stanford.edu). Use of the synchrotron light sources requires a separate approval process.

REFERENCES

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Department of Energy, 2006. EMSL Strategic Plan 2006. Prepared for DOE under contract DE-AC06-76RL01830 by Pacific Northwest National Laboratory (PNNL-15578), http://www.emsl.pnl.gov/docs/strategic_plan_01_06.pdf)

Program Funding

It is anticipated that up to **$5,000,000 will be available for approximately 15 to 20 awards** to be made in Fiscal Year 2011, contingent on the availability of appropriated funds. Funds for this research will come from SBR. For a **Full Application** (narrative limited to 20 pages), applicants may request project support up to three years, with outyear funding contingent on the availability of appropriated funds, progress of the research and programmatic needs. Annual budgets for single investigator projects may not exceed $250,000/year total costs. Annual budgets for multi investigator projects may not exceed $450,000/year total costs. For an **Exploratory Application** (narrative limited to 10 pages), applicants may request project support for up to two years with a

total budget of up to $150,000. *Applications that are not compliant with either the page or budget limitations described above may be declined administratively without review.*

DOE is under no obligation to pay for any costs associated with the preparation or submission of an application. DOE reserves the right to fund, in whole or in part, any, all, or none of the applications submitted in response to this FOA.

Merit Review

Applications will be subjected to scientific merit review (peer review) and will be evaluated against the following evaluation criteria which are listed in descending order of importance 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; and
4. 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 FOA and the agency's programmatic needs. It should be noted that external peer reviewers are selected on the basis of their scientific expertise and the absence of conflict- of-interest issues. Both Federal and non-Federal reviewers may be used, and submission of an application constitutes agreement that this review process is acceptable to the investigator(s) and the submitting institution.

A key consideration in the evaluation of research applications will be the potential impact of the proposed research project on the SBR mission to provide the basic science in support of environmental remediation and long term stewardship of DOE sites. **All applications submitted in response to this FOA must explicitly state in the Executive Summary how the proposed research will support the accomplishment of the BER Long Term Measure to** *"provide sufficient scientific understanding such that DOE sites would be able to incorporate coupled physical, chemical and biological processes into decision making for environmental remediation and long-term stewardship."* Applicants should address the relevance and impact of their proposed research project to a broad scientific audience because all applications will be reviewed by an interdisciplinary panel as well as DOE staff with a wide range of technical backgrounds. We anticipate using two panels to review all of the applications submitted to this FOA. Although the technical evaluation will primarily be based on written reviews by individual subject matter experts, all of the panelists will have access to all of the applications reviewed by the panel and they will be asked to read the Executive Summaries of all of the applications. After a detailed presentation of the scientific and technical merits of an application by the primary technical reviewers and a vigorous discussion of the application by the entire panel, all panelists will be asked to make individual recommendations as to the funding priority - classifying the applications as Must Fund, Should Fund, Could Fund or Don't Fund. DOE program managers will use all of this information as well as programmatic factors such as the balance among the program areas, research already in progress and risk-reward balance to make the final funding decisions.

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

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