

**Office of Science
Financial Assistance
Funding Opportunity Announcement
DE-PS02-08ER08-12**

***Systems Biology, Model Organism Development, and Enzyme
Discovery for Biological Hydrogen Production***

The Office of Biological and Environmental Research (BER) of the Office of Science (SC), U.S. Department of Energy (DOE), hereby announces its interest in receiving applications for research that supports the Genomics: GTL research program (<http://www.genomicsGTL.energy.gov>). In this Solicitation, applications are solicited for: i.) systems-level research to improve understanding of microbial regulatory and metabolic networks related to hydrogen production, ii.) development of new model organisms for microbial hydrogen production, and iii.) targeted approaches for the identification and characterization of enzymes and biochemical pathways relevant to biological hydrogen production in genome and metagenome sequences.

PREAPPLICATIONS

Potential applicants are required to submit a brief preapplication, referencing **Program Solicitation DE-PS02-08ER08-12 for receipt by DOE by 4:30 p.m., Eastern Time, February 22, 2008**. Preapplications will be reviewed for conformance with the guidelines presented in this Solicitation and suitability in the technical areas specified in this Solicitation. A response to the preapplications encouraging or discouraging formal applications will be communicated to the applicants by **February 29, 2008**. Applicants who have not received a response regarding the status of their preapplication by this date are responsible for contacting the program to confirm this status.

Only those preapplicants that receive notification from DOE encouraging a formal application may submit full applications. **No other formal applications will be considered.**

Potential applicants **must** submit a brief preapplication that consists of no more than three pages of narrative stating the research objectives, describing the technical approach(s), and identifying the proposed team members and their expertise. The intent in requesting a preapplication is to save time and effort of applicants in preparing and submitting a formal project application that may be inappropriate for the solicitation. Preapplications will be reviewed relative to the scope and research needs as outlined in the summary paragraph and in the SUPPLEMENTARY INFORMATION. The preapplication should identify, on the cover sheet, the title of the project, the institution or organization, principal investigator name, telephone number, fax number, and e-mail address. No budget information or biographical data need be included, nor is an institutional endorsement necessary.

Preapplications referencing Program Solicitation **DE-PS02-08ER08-12** should be sent as a text file or single PDF file attachments via e-mail to: **genomicsGTL@science.doe.gov** with "Preapplication **DE-PS02-08ER08-12** Biohydrogen Lastname Institution" as the subject. No FAX or mail submission of preapplications will be accepted.

APPLICATION DUE DATE: April 9, 2008, 8:00 pm, Eastern Time

Applications must be submitted using Grants.gov, the Funding Opportunity Announcement can be found using the CFDA Number, 81.049 or the Funding Opportunity Announcement number, DE-PS02-08ER08-12. Applicants must follow the instructions and use the forms provided on Grants.gov.

GENERAL INQUIRIES ABOUT THIS NOTICE SHOULD BE DIRECTED TO:

Agency Contact:

Dr. Sharlene Weatherwax

Phone: (301) 903-6165

Email: sharlene.weatherwax@science.doe.gov

SUPPLEMENTARY INFORMATION:

The Genomics:GTL program supports basic research aimed at achieving systems level understanding of plants, microbes, and microbial communities relevant to DOE missions in bioenergy, bioremediation of environmental contaminants, and carbon cycling and biosequestration. The Hydrogen Fuel Initiative of 2003 encourages research and development of carbon-neutral hydrogen production for future national bioenergy needs. In support of this initiative, further research is needed on the molecular mechanisms underlying biological hydrogen production by microbes via various biochemical mechanisms such as nitrogenase-mediated, fermentative, and biophotolytic pathways. Advancing fundamental scientific knowledge in this area will be critical to characterizing enzymatic structure and function, modeling regulatory and metabolic networks, and engineering of enzymes and organisms to improve biological hydrogen production for a future hydrogen economy.

Continued development of model systems for biological hydrogen production will require systems biology approaches aimed at defining the regulatory and metabolic networks governing hydrogen metabolism at the organism level. This is especially important in terms of understanding the interrelation of relevant cellular pathways and processes including photosynthesis, carbon assimilation, nitrogen fixation, and maintenance of redox homeostasis. Recent advances in functional genomics such as transcriptomics, proteomics, and metabolomics have provided powerful new approaches for developing models of regulation and metabolism necessary to understand how microbial cells integrate environmental signals and respond to shifting environmental conditions. Further research is needed on systems-level processes relating to hydrogen production in both established and developing model organisms.

The majority of studies on biological hydrogen production by microbes (i.e. prokaryotes, unicellular eukaryotes, and fungi) are based on a relatively limited set of model organisms. DOE recognizes that additional research to characterize the vast diversity of enzymes and metabolic pathways related to microbial hydrogen that exist in nature has tremendous potential to advance biohydrogen production. Identification of new model organisms, further characterization of alternative strains of existing models, and development of genetic systems and other tools to advance research on promising new models would greatly facilitate the functional understanding of new biohydrogen systems. In addition to studying model organisms in pure culture, some biochemical reactions of interest may require the concerted action of consortial groups of microorganisms ranging from dual partner syntrophic associations to more complex community-level interactions in marine or terrestrial environments. Although study of these systems presents a greater technical challenge, understanding hydrogen production and metabolism by multi-species consortia is likely to significantly expand our understanding of the diversity of hydrogen-related biochemical pathways. In addition to investigations of cultivated organisms, innovative approaches are needed to identify and characterize target genes and enzymes relevant to hydrogen production in genome sequences of cultivated organisms as well as in uncultivated organisms whose genomes are enmeshed within metagenome libraries.

Applications are solicited for basic research on biological hydrogen production in the following areas:

- **Systems-level studies on regulatory and metabolic networks involved in microbial hydrogen production in established or developing model organisms.** Emphasis should be placed on understanding processing of environmental signals and/or integration of relevant biochemical pathways and cellular processes at the organism level. Applications focused on metabolic engineering for improvement of hydrogen production via alteration of specific metabolic modules are not encouraged for this solicitation.
- **Development of new model organisms or multi-species microbial consortia for biological hydrogen production.** Applicants must address how new models will advance general understanding of microbial hydrogen production and serve as potential platforms for systems-level studies. Development needs (i.e. new genetic or genomics tools, physiological characterization, etc.) should be clearly articulated. Applications for the refinement or incremental improvement of established model systems are not encouraged.
- **Targeted identification of novel genes, enzymes, and biochemical pathways relevant to biological hydrogen production (i.e. hydrogenases, nitrogenases, electron transport chains, photosystems, etc.) in genome sequences or metagenome libraries.** Potential approaches may include (but are not limited to) bioinformatics, functional characterizations, or combinations thereof applied to genes or proteins of interest. Applications should leverage existing genomic resources; requests for new genome or metagenome sequencing are not encouraged for this solicitation.

Applications to pursue microbial fuel cell systems, biomimetic hydrogen production systems, or process improvements of industrial biohydrogen production from waste streams are not encouraged for this solicitation.

Information and Data Sharing Policy: The Genomics:GTL information-sharing policy requires that all publication related information and materials be made available 3 months after publication. All Principal Investigators (PIs) within the GTL program will be required to construct and implement an Information and Data-Sharing Plan that ensures this accessibility as a component of their funded projects. As a element of an Information and Data Sharing plan, OBER will require that all publishable information resulting from GTL funded research must conform to community recognized standard formats when they exist, be clearly attributable, and be deposited within a community recognized public database(s) appropriate for the research conducted. All experimental data obtained as a result of GTL funded research must be kept in an archive maintained by the Principal Investigator (PI) for the duration of the funded project. Any publications resulting from the use of shared experimental data must accurately acknowledge the original source or provider of the attributable data.

The Genomics:GTL program supports a combination of large, well integrated, multidisciplinary research centers and smaller, focused research projects. This solicitation will support smaller, focused research projects by single investigators or collaborative research teams to develop new technologies, research strategies, or research resources needed by the Genomics:GTL program.

Information on the research projects currently funded by the Genomics:GTL program and a description of project goals and overall program organization can be found at: <http://genomicsgtl.energy.gov/>.

Program Funding

It is anticipated that up to \$4 million total will be available for multiple awards to be made in Fiscal Year 2008. The number of awards will be contingent on satisfactory peer review, the availability of appropriated funds, and the size of the awards. Multiple year funding is expected. Applications may request project support for up to three years, with out-year support contingent on the availability of funds, progress of the research, and programmatic needs. Annual budgets are expected to range from \$250,000 to \$600,000 total costs. DOE is under no obligation to pay for any costs associated with the preparation or submission of a proposal. DOE reserves the right to fund, in whole or in part, any, all, or none of the applications submitted in response to this Notice.

Merit Review Criteria

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 process will include program policy factors such as the relevance of the proposed research to the terms of the announcement and the agencies' programmatic needs. Note that

external peer reviewers are selected with regard to both their scientific expertise and the absence of conflict-of-interest issues. Both Federal and non-Federal reviewers may be used, and submission of an application constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

Posted on the Office of Science Grants and Contracts Web Site
January 28, 2008.