

Letter Report of the Biological and Environmental Research Advisory Committee on Long Term Performance Goals for the Office of Biological and Environmental Research

In a letter dated April 21, 2004, (<http://www.science.doe.gov/ober/berac/PARTS.pdf>), Dr. Ray Orbach asked the Biological and Environmental Research Advisory Committee (BERAC) to “define a process that it will use to regularly evaluate BER’s interim progress toward achieving its long term performance goals.”

BERAC had a preliminary discussion of this charge with Joel Parriott, BER’s Office of Management and Budget (OMB) Examiner, at the April 29-30, 2004, BERAC meeting and a full discussion at the November 3-4, 2004, meeting. The following is a summary of the BERAC discussion and recommendations. In addition to a discussion on how BERAC would evaluate BER’s interim progress, the Committee also discussed the interim and long term goals themselves.

Summary and Recommendations

As modified by the discussion in this letter report, BERAC gives general approval to the BER component of the SC performance plan, to the strategy of having long term performance goals that are scientific grand challenges intended to focus the BER program, and to the role of BERAC and BERAC subcommittees for each program area in periodically evaluating BER’s progress toward and strategies for achieving these goals.

BERAC recommends using a series of four, rotating expert review panels that would periodically evaluate BER program progress towards its interim and long term performance goals. The panels, composed of BERAC members and scientific experts from the research community, would evaluate program research accomplishments based on publications, scientific advances and research solicitations issued during the period under review. The panels would also evaluate BER program plans such as strategic plans, roadmaps, and planned solicitations for research during the next performance period.

This review of past progress and the planned path forward would be used to determine if BER had made and was planning to make research investments that would or could logically lead to the achievement of the interim and long term goals. Each of BER’s four program areas, life sciences, climate change research, environmental remediation sciences, and medical sciences would be reviewed every 3 to 4 years and the reports would be issued as BERAC reports and posted on the BERAC web site (<http://www.science.doe.gov/ober/berac/reports.html>).

Summary of process to develop BER goals

BER developed its long term goals in an iterative process involving the Office of Science (SC) and OMB. OMB was not directly involved in the development of BER’s interim goals; however, they are included in the SC strategic plan that was reviewed by OMB. All of BER’s performance metrics measure “things” whose development can be

measured versus knowledge which is much more difficult to measure or quantify. BER was told that its metrics represented the type of research outcomes that OMB was looking for in a research performance plan and that BER had done a good job of translating fundamental science into measurable things.

Prior to its April 2004 meeting, BERAC gave preliminary approval to BER's four long term (2013 to 2015 time frame) performance goals.

BERAC comments on BER goals

General comments

Some of BER's interim goals seem pretty ambitious, e.g., a photosynthetic microbe for continuous hydrogen production by 2008. Success in achieving a goal like this one will require a number of interim scientific successes none of which can be guaranteed given the current state of scientific knowledge and technology development. At the April 2004 BERAC meeting, Joel Pariott said that it was better to fail on overly ambitious goals than to have goals that are not scientifically or technically challenging. The real issue for OMB is whether the right science is being done in the right way.

The challenge for BERAC will be to periodically evaluate the BER program to determine if it has an organized approach of research investments that will or could logically lead to the achievement of these goals. BERAC (and presumably OMB) view these goals, especially the long term goals, more as grand challenges, with all of the uncertainties and caveats associated with grand challenges, than as absolute goals whose achievement is certain. BERAC believes that true progress and success in a basic research program like the BER program cannot be measured using a series of absolute measures. However, BERAC does believe that the strategy of evaluating BER's research investment strategy and the resultant scientific achievements as they relate to a series of long term grand challenges is an appropriate way to measure and evaluate the progress and success of the BER program.

Comments on Life Sciences Goals

None

Comments on Climate Change Research Goals

BERAC is concerned that these challenging goals will, in the end, be used as absolute expectations of promised progress and deliverables. This would be a no-win scenario for BER since it runs counter to the OMB view that these are more stretch goals than absolute promises and that success should be measured in the reasonable context of scientific success and failure that is a normal part of research. As a result, the following revised and new interim and long term measures are proposed:

- Deliver new measurements of clouds especially in regions where observations have been missing (2006)
- Include improved cloud simulations in a climate model (2007)
- Measure critical ecosystem responses to climate change for high priority ecosystems (2008) CCSP
- Develop/validate improved models predicting the effect of aerosols on climate forcing (2010)
- Develop a climate model that links the Earth climate system with Earth's biological systems (2010) CCSP
- Develop improved climate data and models for policy makers to determine more realistic levels of greenhouse gases by 2015. Reduce differences between observed temperature and model simulations at subcontinental scales using all available, validated data (2013) CCSP

These suggestions are based on concerns that relate to intended or unintended implications of the language used in some of the interim and long term goals as currently worded. For the long term goal, BERAC realizes that the phrase “safe level of greenhouse gases” is important to the international framework agreement and to the Administration but BERAC is not comfortable with its use and recommends that it be replaced by “realistic.”

Comments on Environmental Remediation Goals

Both the long term and interim goals for the Environmental Remediation Research Program (EERP) are very dependent on activities in the Office of Environmental Management (EM). As a result, they can not reasonably be used as independent measures of BER progress or success since long term success will be dependent on EM’s ability or willingness to adopt new remediation tools or strategies developed by BER research. At a minimum, BERAC will need to hear from groups such as EM when evaluating BER research progress and success in the ERRP.

BERAC is concerned that the focus of the long term BER measure only on biology-based solutions is not reasonable and suggests that it be modified to read “By 2015, provide sufficient scientific understanding to allow a significant fraction of DOE sites to incorporate coupled biological, chemical and physical processes into decision making for environmental remediation.”

In addition, BERAC recommends that the discussion of this measure be modified as follows:

WHAT DOES THIS MEASURE MEAN?

The ability to make decisions regarding environmental remediation requires a robust understanding of the biological, chemical and physical processes that control contaminant fate and transport. Advances in that understanding will allow site personnel to construct conceptual models which are an important basis for making decisions as to the nature, extent and timing of remedial activities. DOE sites do not currently have robust

conceptual models for all of their clean up locations and accurate prediction of contaminant transport in complex environmental settings requires incorporation of advanced coupling and scaling concepts, particularly with regard to biological processes.

WHY IS THIS MEASURE IMPORTANT?

The DOE weapons complex presents some of the most daunting cleanup challenges facing this nation - approximately 100 cleanup or long term stewardship sites containing over 3000 individual waste areas, 50% of which have soils, sediments, or groundwater contaminated with radionuclides or metals. Today's technology of excavation and treatment is limited in its application, often cost prohibitive, and frequently ineffective. Decisions to implement measures ranging from no-action alternatives, to complete excavation and off-site disposal need to be based on solid scientific understanding of the biological, chemical and physical processes controlling the fate and transport of contaminants. Enhanced understanding of these processes will have a huge impact on DOE's ability to implement effective remedial decisions.

DEFINITION OF "SUCCESS"

ERRP-sponsored advances in understanding the biological, chemical and physical components of contaminant fate and transport are incorporated into conceptual models at 20% of the DOE cleanup and long term stewardship sites.

DEFINITION OF "MINIMALLY EFFECTIVE"

ERRP-sponsored advances in understanding the biological, chemical and physical components of contaminant fate and transport are incorporated into conceptual models at 10% of the DOE cleanup and long term stewardship sites.

HOW WILL PROGRESS BE MEASURED?

Progress toward achieving these measures will be reviewed every 3 years by BERAC and its EERP subcommittee. Progress will be measured based on actual research results including peer reviewed publications, on discussions with "customers" of BER research in EM, and on an evaluation of BER's overall approach of research investments that will or could logically lead to the achievement of both its interim and long term goals. Expert Review will rate progress as "Excellent", "Minimally Effective" or "Insufficient" and will include an evaluation of progress to develop a scientific understanding of the coupled biological, chemical and physical processes that control contaminant fate and transport as this relates to DOE environmental remediation needs.

Comments on Medical Sciences Goals

The long term Medical Sciences goal does not include anything about medical devices such as the artificial retina, a strength of the BER program. In addition the interim goals do not quite match up since they are a mix of engineering and science goals. A broad goal could be diffusion of technology rather than just the artificial retina itself. The following additional interim and long term goals are proposed to fill in interim performance goals gaps from 2007 to 2013:

- [modification of current interim goal] Preclinical tests of radiolabeled probes for imaging defective genes and aberrant gene products (2006).
- Advance rate of development and translation of highly specific radiotracers and radiotherapeutic agents for applications in neuropsychiatric illness and cancer (2006-2010).
- Develop and test multi-dimensional imaging strategies to probe mechanisms underlying gene-disease/behavior relationships (2006).
- Develop next generation of detectors, electronics and reconstruction algorithms to advance PET, SPECT and multi-modality imaging (2008).
- Develop mechanisms to support multi-disciplinary training centers in the imaging sciences through training grants and interagency agreements. (2006)
- Develop advanced imaging hardware and software for imaging a moving subject to advance the study of child development (2010).
- Application of microengineering and remote technology to advance radiotracer chemistry with short lived isotopes (2008).