

February 24, 1998

Dr. John Stringer  
Director of Applied Research  
Exploratory & Applied Research  
Electric Power Research Institute  
3412 Hillview Avenue  
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Dear Dr. Stringer:

First, I want to thank you for two years of outstanding service as Chair of the Basic Energy Sciences Advisory Committee (BESAC). Under your leadership, BESAC activities have produced extraordinary results that already have -- and will continue to have -- broad impacts in the Basic Energy Sciences program. I especially want to acknowledge BESAC's help in the decision process for the High Flux Beam Reactor and in the study "Synchrotron Radiation Sources and Science." Both activities garnered considerable attention from and are highly respected by the scientific community and the press. I appreciate the professional, thoughtful manner in which both studies were carried out and the objective, independent advice that you provided.

During the coming year, I would like BESAC to advise me on three issues, each of which will require formation of a panel or workshop(s). Because it may be two months before the next BESAC is officially impaneled, I would like for you to initiate these activities and assist with the transition to the new chair of BESAC. In each case, I have provided an overview of the activity, but I would like the detailed charge to each panel or workshop to be developed through discussions among the chair of BESAC, the chair of the panel or workshop, and the Associate Director of the Department's Office of Basic Energy Sciences (BES).

The first activity is a review of the activities at the High Flux Isotope Reactor (HFIR). As you know, BES is making a significant investment in upgrading capabilities for both cold and thermal neutron scattering at HFIR; this facility is important to us and to the neutron science community. For the foreseeable future, HFIR will be our only operating reactor for neutron science. I would like BESAC to form a panel to review the science and the user programs at HFIR. This panel should, of course, contain experts in neutron scattering, but it should also contain members who will be able to address the effectiveness of the user program; user support; proposal review mechanisms; and availability, dependability, and reliability of the facility for users. By analogy with the Birgeneau study of the synchrotron radiation light sources, the review should consider the full range of activities at HFIR regardless of whether or not they are supported by the BES program.

The second activity is a panel to recommend appropriate R&D activities for the next generation of high-intensity, coherent light sources. I take very seriously the recommendation of the Birgeneau Panel that we continue to invest in R&D for

significantly more intense light sources. I would like this panel to consider both fourth generation x-ray sources, as recommended by the Birgeneau Panel, and other advanced forms of high intensity, coherent light sources. As with the Birgeneau Panel, I would like this new panel to contain both experts and generalists.

The third activity is to help the BES program explore the frontiers of complex and collective phenomena. As described in the fiscal year 1999 Congressional Budget, BES has proposed an initiative to study complex and collective phenomena. Much of the research supported by the BES program and its predecessor organizations during the past 50 years has been devoted to solving difficult problems in idealized, simple systems. The challenge now is to use that knowledge to understand complex systems. This research would be at frontiers of basic research and would be revolutionary rather than evolutionary. It will likely involve multidisciplinary and/or interdisciplinary efforts. Further, the research would bridge the gap between an atomic level understanding (reductionist view) and a continuum mechanics understanding (classical view) of complex and collective phenomena. As noted in the budget narrative, some important categories of studies that are expected to be included in the initiative in complex and collective phenomena are:

Materials that are beyond binary; that lack stoichiometry; that are far from equilibrium; that have little or no symmetry or low dimensionality

Functional synthesis

Phenomena beyond the independent particle approximation

Scaling in space and time

The control of entropy, as happens, for example, during photosynthesis.

I will appreciate your advice on the opportunities for forefront, basic research in these and other appropriate areas of investigator-initiated research in complex and collective phenomena. I am specifically seeking descriptions of forefront research areas that are not necessarily discipline specific. Significant questions that must be addressed include the importance of the research areas to science, to the mission of the Department, and to society and why is it appropriate (or not) to pursue these activities now. The divisions in BES have councils that have sponsored many workshops to review important areas of research; you might wish to involve these councils in your activities.

I appreciate BESAC's willingness to take on these important activities, and I look forward to meeting with you and learning of your progress throughout the coming year.

Sincerely,

Martha A. Krebs  
Director  
Office of Energy Research