



Department of Energy
Office of Science
Washington, DC 20585

Office of the Director

January 2, 2013

Professor John C. Hemminger
Chair, Basic Energy Sciences Advisory Committee
Vice Chancellor for Research
Professor of Chemistry
Aldrich Hall 160
University of California, Irvine
Irvine, CA 92697

Dear Professor Hemminger:

Thank you very much for your continuing service to the Office of Science and the scientific communities that it serves as the Chair of the Basic Energy Sciences Advisory Committee (BESAC). I realize that BESAC, along with the other Office of Science advisory committees, is in the midst of assisting us with the prioritization of scientific user facilities. Let me assure you that the prioritization charge is an important one and will ensure optimal benefit of Federal investments across all Office of Science programs. For BES, another critical decision concerns the future direction of photon science as driven by x-ray light sources.

The past decades have seen significant growth in world-wide development and deployment of synchrotron light sources which in turn have fueled the vast advancement in photon-driven science. The broad and far-reaching impacts in diverse fields of science and technology have made light sources an indispensable tool for modern research as the foundation for innovation and national competitiveness. The Office of Science has been in the vanguard of the photon science expansion and is presently the steward of the Nation's premier light source portfolio consisting of four storage-ring-based synchrotron light sources and one free-electron laser—the Linac Coherent Light Source—with unparalleled peak brightness and ultrashort, femtoseconds pulse duration. These light sources were the direct result of visionary and strategic Federal investments in the 3rd and 4th generations of light sources as informed by prior BESAC studies, and collectively they have enabled the U.S. leadership in photon science. However, U.S. leadership is being challenged today by an ever increasing array of advanced international light sources, as the utility and prowess of light sources gain world-wide recognition. To ensure sustained U.S. leadership in photon science within the extremely competitive international environment requires that SC maintain and develop the best photon sources to address the most challenging scientific problems.



I would like BESAC to provide me with advice on the future of photon sources and science, which will require formation of a panel of experts and a workshop. As with prior studies of photon sciences, I believe that it is important to consider both new science opportunities and new photon source technologies in parallel as you consider your advice.

I would appreciate the objective, independent advice of BESAC in the following areas:

- Assessment of the grand science challenges that could best be explored with the current and possible future SC light sources. The assessment should cover the disciplines supported by Basic Energy Sciences and other fields that benefit from intense light sources.
- Evaluation of the effectiveness of the present SC light source portfolio to meet these grand science challenges.
- Enumeration of future light source performance specifications that would maximize the impact on grand science challenges.
- Prioritized recommendations on which future light source concepts and the technology behind them are best suited to achieve these performance specifications.
- Identification of prioritized research and development initiatives to accelerate the realization of these future light source facilities in a cost effective manner.

The panel should be aware of and use the results of previous studies and workshops devoted to storage-ring-based synchrotron light sources and free-electron lasers. Specifically, the panel should build upon the 2007 BESAC report, *Directing Matter and Energy: Five Challenges for Science and the Imagination*; the 2008 BESAC report, *Next-Generation Photon Sources for Grand Challenges in Science and Energy*; and the collection of reports from the Basic Energy Sciences Workshop: *Accelerator Physics for Future Light Sources* (W.A. Barletta and J.N. Corlett, Co-chairs; September 15-17, 2009). A particularly useful report that enumerated clear advice and produced beneficial actions was the *Report of the Basic Energy Sciences Advisory Committee Panel on Novel Coherent Light Sources* (S.R. Leone, Chair; January 1999), which provided concise, thoughtful recommendations for a series of steps that needed to be undertaken towards the development of a revolutionary new light source aimed at high-impact science.

It is anticipated that the BESAC panel will supplement its expertise on photon sources by consultation with appropriate external accelerator technology experts, including scientists in relevant fields. The BESAC report on this topic should be delivered to me by July 15, 2013, and the results would be presented to the public at the subsequent BESAC committee meeting.

W.F. Brinkman



Director, Office of Science