

## **Decision Document for the Future Site of the National Energy Research Supercomputer Center**

Based on a peer review process aimed at securing the highest level of long-term performance in Department of Energy mission areas, the Office of Energy Research (ER) has determined that the National Energy Research Supercomputer Center (the Center) should be located at the Lawrence Berkeley National Laboratory (LBNL). Competitive proposals for future operation of the Center were received from Lawrence Livermore National Laboratory (LLNL), which is the incumbent operator of this facility, as well as from LBNL. Within a constrained budget environment, the LBNL proposal was deemed to be superior based on the selection criteria established for the competition. Locating the Center at LBNL will create important opportunities to achieve enhanced integration of the Department's computational resources with major research programs in energy sciences, chemistry, high-energy and nuclear physics, materials science, and genomic biology. Proximity of the Center to the University of California at Berkeley will permit important leveraging of physical and intellectual resources, contributing to the development of new high performance computing systems and architectures. Although significant policy and programmatic issues emerged during this competition, the Department believes that they have been addressed satisfactorily. The decision to locate the Center at LBNL will contribute to the Department's overall goals of enhanced performance and productivity of the DOE National Laboratories.

### **Background**

The Center was created in 1973 and funded by ER to provide high performance computing and networking services to all ER programs at National Laboratories, universities, and industry. Its mission is to function as an unclassified, open user facility for production-level scientific computing. As such, the Center's mission is unique within the laboratory system. From its inception, the Center has been managed and staffed as a separate entity within LLNL. The Center, as part of its networking function, manages the Energy Sciences Network (ESnet).

During the past few years, technical reports to the Department were prepared by the scientific users of the Center covering different aspects of user requirements and expectations. These reports cited the need to transition to massively parallel processing (MPP) as the technology of computing shifts to scalable, parallel systems. They recommended that ER procure a large capacity MPP system for installation at the Center. This procurement is underway and is almost complete. In addition, ER researchers, in particular the ESnet users, have recognized the need to integrate the Center's computational resources with ER experimental resources (i.e., science facilities such as the Advanced Light Source and the Advanced Photon Source) in order to provide improved remote access for experimentation and data analysis.

With these important changes in user needs and computing technology, ER

determined that it was appropriate to reexamine the Center's technical directions and management. The Center has been at the same site for over twenty years and, although the Center has been well managed at LLNL, ER concluded that there was an opportunity to solicit ideas to redefine the Center's vision for the future and improve its institutional support and cost-effectiveness. This led ER to recompute the Center's functions.

Several factors, however, limited the ability of ER to conduct a broad competition for the Center. For example, the Center has many contracts held by the University of California, such as for the operation of ESnet, which would take years to compete. Therefore ER decided to limit this competition to LBNL and LLNL because, although LBNL is sufficiently different from LLNL to have a meaningful competition, it is also managed by the University of California. If a transition became necessary, the Center's contracts could be reassigned without delay, minimizing disruptions to the Center's user community.

### **Merit Proposal Review and Evaluation Process**

On April 21, 1995, the Director of the Mathematical Information and Computational Sciences (MICS) Division of ER sent letters to the Directors of LLNL and LBNL to begin the site competition process. Proposals were received and initially evaluated in June 1995. Based upon input from the reviewers, letters were again sent to the two Directors to request updated, final proposals for evaluation which would resolve outstanding issues. The letters specified the six selection criteria: benefits to ER programs, laboratory commitment and support, cost considerations, technical support and feasibility, collaborative opportunities, and ability to integrate new technology.

In September 1995, the reviewers completed their evaluations and made independent recommendations to the MICS Division. The reviewers found that both proposals were competitive. A significant majority of the reviewers recommended that the Department accept the LBNL proposal because of what they deemed to be its superior long-range vision, its better staffing and services for essentially the same cost, and improved opportunities for internal and external collaborations.

### **Selection Process**

Since both proposals were strong, making a decision has been complex and difficult. Many factors were considered in making the decision.

**Cost:** In the LBNL proposal, the Center will be closely integrated with both the laboratory and university computing centers. This will permit the Department to leverage scientific talent through the sharing of physical and personnel resources between LBNL and the University's computing centers. In so doing, both the productivity and cost-performance of NERSC are expected to increase, thus

contributing to Departmental policy and Congressional direction to increase the value of the American taxpayers' investments in federal programs. At the same cost, the LLNL proposal would support fewer staff and thereby provide less support to our users.

**Transition Risk:** A significant concern is the potential for disruption in service to users during a possible transition or move of the Center's facilities to another location. There is clearly less risk of physical disruption to the users in keeping the Center at LLNL. This was considered in the decision, and weighed against the risks and benefits of moving the Center to LBNL.

ER is confident of LBNL's ability to manage the transition. LBNL has proposed excellent laboratory space for the center. It has agreements with various vendors to insure the successful operation of different components of the Center infrastructure upon the completion of their physical move. As part of the University of California, the Center's many contracts at LLNL can be reassigned to LBNL without problems or delays. NERSC is at present procuring a new supercomputer system which can be installed directly at LBNL during 1996 and which will, therefore, not require relocation. There is some downtime that will have to be absorbed by the user community during the physical move of the Cray C-90 supercomputer system to LBNL, which would occur in March 1996.

**ER Program Integration:** Although LLNL has provided excellent service to many ER researchers, reviewers believed that LBNL is well positioned to make supercomputing more important to ER programs that have had less interaction with the Center at LLNL. LBNL is itself a microcosm of the ER program spectrum, with on-site representation of all major ER program areas. LBNL is prepared to make the Center and the other LBNL computer and communications research the focus of science from the rest of the LBNL's divisions. LBNL also has managed a Distributed Computing Environment project for the MICS Division and will, as it proposed, provide leadership to the ER community in remote access opportunities for facilities such as the Advanced Light Source.

**Federal HPCC Program:** The Center plays an important role in the Nation's High Performance Computing and Communications (HPCC) program. Reviewers believe that at LBNL the Center would be more cost-effective and would be better integrated with other ER programs and with the University of California at Berkeley. They believe this leveraging of resources will advance scientific fields through increased use of computation and contribute to the development of new high performance computing architectures and systems. This will enhance the role of the Center in the nation's computing and communications program.

**Impact on National Security-Related Supercomputing:** A significant concern is whether moving the Center to LBNL would have an adverse impact on the Accelerated Strategic Computing Initiative (ASCI), which is a major component of the Science-Based Stockpile Stewardship program. We found that there would not

be a significant adverse impact. The Center has not been part of the defense mission of the LLNL, nor was it planned to be part of ASCI. The Center increased LLNL's ability to attract top computer scientists, but ASCI is a sufficiently compelling program that LLNL should not have difficulty attracting top computer scientists without the Center. Moreover, the increased cost effectiveness of the LBNL proposal will allow some ER computing resources to be directed to collaborative activities with Defense Programs that will benefit ASCI that otherwise would not have been possible.

**Impact on the DOE Laboratories as a System:** There were concerns about how locating the center at LBNL would affect efforts to make the DOE laboratory complex function more effectively as a system. Some observers may interpret the decision to relocate NERSC to LBNL as support for consolidating R&D activities in the laboratories for which programs have landlord responsibility. Such an interpretation is incorrect. The broader principle is that each of the Department's R&D programs should be maximizing--not minimizing--the opportunities for funding across the entire laboratory system, in academia, and the private sector. All research programs and facilities need to be periodically examined through peer review and other processes in order to enhance scientific innovation, programmatic evolution, and overall quality and performance. Such reexaminations create an opportunity to cut costs and enhance integration of research efforts with other institutions, including other laboratories and academia. These factors weighed heavily in the decision to locate the National Energy Research Supercomputer Center at LBNL.

## **Conclusion**

Based on the reviews of the proposals and a consideration of the factors above, we have decided to locate the Center at LBNL. This should result in a more cost-effective Center. The Center at LBNL will be more effective in applying high performance computing technology to new areas of science. It will also provide a new long-range vision, better staffing and services for the same cost, and improved opportunities for internal and external collaboration. It will establish new and very strong collaborations between LBNL and the University of California at Berkeley to develop and prototype new high performance computing architectures and systems. The Center will be well poised to lead the introduction of advanced computing and networking technologies. It also will contribute to our understanding of the computational resources and architectures needed by important "Grand Challenge" interdisciplinary science projects. As part of the Nation's High Performance Computing and Communications program, the Center will contribute greatly to the Nation's capabilities.