SYNCHROTRON LIGHT

Future Brightens for Berkeley Facility

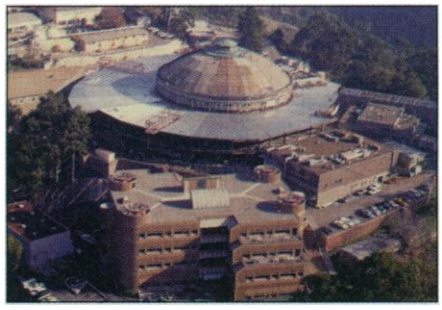
The Advanced Light Source (ALS) at Lawrence Berkeley National Laboratory has won a new lease on life following a scientific pep rally last week at the facility overlooking San Francisco Bay. The meeting set new research directions for the 5-year-old, $100 million synchrotron, which last fall was criticized by a Department of Energy (DOE) panel for failing to live up to its billing (*Science*, 3 October 1997, p. 25). Combined with an easing of fiscal pressures and organizational changes at the lab, the new list of scientific opportunities has persuaded DOE managers to keep the facility open and even to consider a funding boost.

Tight budgets, growing operating costs, and the need to upgrade older synchrotrons led DOE officials last year to create a panel to set priorities for the growing field of synchrotron science, which uses the brilliant x-rays from these machines to probe matter. The panel, chaired by Robert Birgeneau, dean of science at the Massachusetts Institute of Technology, ranked the ALS last on the list of the department's four synchrotrons because of the inability of its managers to explain the research opportunities offered by its low-energy, or soft, x-rays—a fault acknowledged by Neville Smith, ALS's scientific program head. The report "was a wake-up call," says Iran Thomas, materials sciences chief in DOE's basic energy sciences division.

That call was heard by the growing number of researchers who use synchrotron radiation to probe many kinds of matter. "Some people viewed the Birgeneau report as an attack" on soft x-ray research, says Smith, "so they made a rousing defense." The crowd of 300 spilled out into the hallways, forcing lab officials to set up a video link in another conference room. "It was an enormous morale boost," he adds.

The researchers explored how the ALS could assist in answering fundamental questions in those areas. "Each group came out with ideas for very strong science that can be done in the soft x-ray region," says Thomas. They will submit a new batch of proposals to DOE in the coming months, he adds. "This was a needed course correction," says Thomas Russell, a member of the Birgeneau panel from the University of Massachusetts, Amherst, who led the polymers and soft matter team.

Lab managers have also made changes. ALS director Brian Kincaid, for example, now reports directly to the lab director, while Smith's role as scientific chief has been expanded to give ALS science a higher profile. A task force of ALS users led by Pier Oddone, deputy lab director, will report by July on how the facility can be made more user-friendly.



LBNL

Seeing the light. Users changed DOE's view of the Advanced Light Source.

Good ideas and improved management could loosen DOE's purse strings, says Thomas. The department chopped the facility's $33 million operating budget for 1998 by $2.5 million, but this fall DOE will consider augmenting funding for the ALS in the president's 1999 request, which already includes a slight increase. "The ALS," he asserts, "is not going to be shut down."

–Andrew Lawler

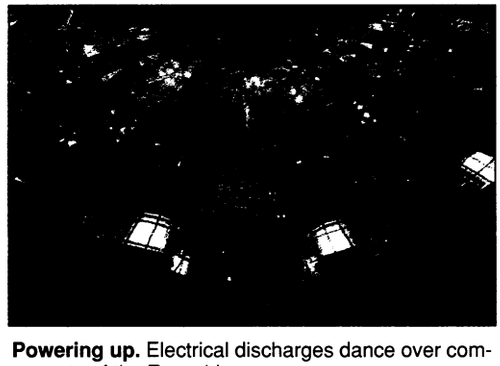
ENERGY

Sandia Steps Into the Fusion Race

With a letter delivered on Monday to the Department of Energy (DOE), a once obscure program at New Mexico's Sandia National Laboratories has made a bid to become a serious contender in the race for fusion energy. Sandia officials say the facility they are proposing could generate at least 10 times more fusion energy at about one-third the cost of the $1.2 billion National Ignition Facility (NIF) being built at Lawrence Livermore National Laboratory in California, although they insist the two machines should not be seen as competitors. Researchers at NIF and elsewhere note that much more detailed studies are needed to see if these projections are realistic.

Both X-1 and NIF would ignite fusion in a pellet of hydrogen isotopes. While NIF would do so by crushing it with pulses from a gargantuan laser, X-1 would use x-rays from a plasma imploding after an array of wires is vaporized by a jolt of electric current. Work to date has been done on a smaller device called a Z-pinch, and Sandia is seeking permission to begin conceptual design studies for the more powerful X-1.

The "pinch" that implodes and heats the plasma in these devices results from the powerful magnetic fields generated by the huge jolt of current. Over the last several years, the Z group—about 60 physicists at Sandia, Los Alamos National Laboratory, and Livermore—found that they could boost the symmetry and quality of the implosion, and hence the x-ray power, by adding more wires to the arrays (*Science*, 18 July 1997, p. 306).



RANDY MONTOYA

Powering up. Electrical discharges dance over components of the Z machine.

By using a pair of nested arrays encircling a small plastic cylinder, which puts the brakes on the implosion and converts the kinetic energy to heat and radiation, they were able to push the x-ray output even higher.

Within the last month, the group measured an x-ray "temperature," or energy density, of about 1.8 million degrees. That's high enough to suggest that the X-1, which could deliver much higher current in the wires, could ignite a larger fusion burn than NIF, says Donald Cook, director of Sandia's Pulsed Power Sciences Center. Agrees one fusion researcher outside the Z group, "There is a good chance that an X-1 machine ... is going to be capable of making a lot of x-rays—a lot more than NIF."

Other researchers emphasize that the concept has received little detailed study compared to laser fusion. But most agree that X-1 could complement NIF in simulating nuclear weapons.

Sandia's letter to DOE is just the first step in a long process of seeking funding for the device. While one DOE official says that X-1 "is a serious proposal that deserves careful attention and review," a congressional staffer observes that "there are a lot of projects vying for attention." But given the popularity of DOE's stockpile stewardship program to maintain the nation's nuclear arsenal without actual weapons tests, "I wouldn't rule it out," the staffer adds.

–James Glanz

With reporting by Andrew Lawler.