

words, "to reinvigorating the nation's energy efficiency and renewable energy R&D programs," which suffered severe budget cuts of 50% and 75%, respectively, in the past decade.

During the Reagan years the White House displayed little or no commitment to such policies. Under Bromley, OSTP is in charge of coordinating the global climate research program, but even sources in the Administration admit they are not convinced that the President or any one agency has the interest and influence to bring it off. "It's not clear how the Administration is going to exercise authority over highly independent,

competitive agencies that are all competing for increasingly limited resources," says a DOE official.

Despite this pessimism, Bush has made some headway. He has taken a stand that the US will not destroy any more wetlands, the habitats of large varieties of wildlife. The White House Domestic Council recently urged Bush to campaign for planting 10 billion trees in the US over the next decade. He is virtually certain to call on government agencies, corporate interests and individuals to do that as an easy preventive action against global climate change.

—IRWIN GOODWIN

NSAC BACKS BROOKHAVEN'S RHIC AND SUGGESTS CLOSINGS TO COME

For the Nuclear Science Advisory Committee, the conclusions reached at Boulder, Colorado, last August evoked a bittersweet taste. Committee members were absolutely overjoyed to recommend as NSAC's top priority that the Department of Energy should build the long-sought Relativistic Heavy Ion Collider, but they were saddened at what the project would mean for other elements of nuclear physics. They know, for instance, that by starting RHIC the department will need to make hard choices about closing older facilities.

This disagreeable prospect was raised in a letter to NSAC on 11 July from Robert O. Hunter Jr, director of DOE's Office of Energy Research, who asked the committee to evaluate the proposed facilities in the field. Hunter's letter pointed out that current "budget balancing activities, competition with other highly regarded scientific projects and other pressing and high-priority concerns within DOE all indicate that even maintaining ongoing levels of expenditures will require substantial justification." Accordingly, the letter went on, while RHIC is a one of the "forefront opportunities" in nuclear physics, NSAC needs to consider whether it should be built in light of its implications for nuclear physics and scientific manpower. Specifically, Hunter wanted to know if the community advocates going ahead with RHIC, knowing that the budget for the field would be virtually constant and that the operation of some existing facilities would be curtailed.

The response to Hunter's letter came on 18 August from NSAC Chairman Peter Paul of the State University of New York at Stony Brook. Paul made it clear that NSAC understood

Hunter's message: that when it comes to the economics of science there is no free lunch. Paul explained that a Long Range Working Group that met for a week before NSAC's discussion had rated "swift construction" of RHIC second only to "timely completion" of the Continuous Electron Beam Accelerator Facility at Newport News, Virginia.

Engine of scientific change

CEBAF and RHIC symbolize the progress in nuclear physics as well as some of the problems that afflict the field. The new instruments are patently engines of change. They drive new physics. This makes experiments on older facilities less interesting.

NSAC's endorsement of RHIC was unambiguous. "After the long delay which this project has already experienced," Paul wrote in his letter, "we urge swift start of construction, even under an approximately constant budget for nuclear science." Still, with a DOE budget of around \$300 million for all nuclear physics in 1990 and a likelihood that it will not go beyond \$315 million in fiscal 1991, RHIC might seem a high price to pay. The machine—a 2.5-mile ring in which two beams of heavy ions will collide with a center-of-mass energy of 200 GeV per nucleon—and its detectors and equipment are now estimated to cost \$328 million on completion. According to knowledgeable sources in the Bush Administration, DOE plans to include the first year of RHIC's construction in its 1991 budget request, to be given to Congress in January. The cost of building RHIC would be spread over five years—from 1991 through 1995.

The committee agonized over how to build RHIC in a period when

nuclear physics is unlikely to get much more funding, Paul recalls. Down deep, NSAC knew that however distasteful the idea of closing facilities was, it had to come to grips with the budget dilemma. Assuming a constant budget in nuclear physics, Paul's letter says, RHIC could still be built—but not without sacrifice: Its construction would need to be stretched out from five to six years. Lawrence Berkeley's aging Bevelac, which is capable of accelerating to 1 GeV per nucleon all ion species up to uranium, would be phased out in the mid-1990s; reductions would be made in some programs no longer considered of great value; and Brookhaven's combination tandem Van de Graaff and Alternating Gradient Synchrotron might be curtailed "at an appropriate time." Of these, only the tandem-AGS gives pause. When it was linked with the tandem Van de Graaff at Brookhaven a few years ago, the AGS was transformed from a purely proton synchrotron to a hybrid that also accelerates heavy ions. The machine is now undergoing another transformation that will enable the AGS to accelerate all the heavy ions the tandem can produce, including those as heavy as gold, up to 15 GeV per nucleon.

As for other machines of high priority, NSAC informed Hunter it favored US participation in the building of KAON, a high-intensity 30-GeV K-meson factory that the Canadian government would like to add to the TRIUMF cyclotron operating near Vancouver, British Columbia (PHYSICS TODAY, June, page 44). The committee finds KAON "a very cost-effective and timely opportunity" to investigate important questions in physics. Still, the committee admits that completing CEBAF and starting RHIC will cause budget pressures requiring DOE to look beyond a constant funding level for money to join up with Canada. Canada has sought a total of \$75 million from the US to build KAON over a five-year period and possibly another \$30 million for detectors and other equipment. The total cost of the project is estimated at \$450 million (in US dollars).

Even though DOE adds a 30% contingency to the cost of building projects, it remains uncertain if existing operations at laboratories and universities can be fully funded in an era of severe budgetary constraints. CEBAF was originally figured to cost \$236 million. But then the start of construction was delayed and the job was stretched by a year. The machine is now calculated to be completed for \$265 million. —IRWIN GOODWIN