

committee members "often mocked their own restrictions" with remarks such as " 'P4 is designed to prevent research,' 'P1 is a laboratory plus a bureaucrat,' and 'These high levels are political, not scientific.' "

The committee's recommended changes have yet to be approved by the NIH director; even if approved, it is not yet clear that they will be incorporated into legislation.

Another probable impact of Curtiss's letter was on the mood of delegates attending the Gordon Conference on Nucleic Acids in June this year. It was a letter from the members of the 1973 conference which first directed public attention to the possible hazards of gene splicing. But having heard an exposition from Alexander Rich of the pending legislation, 137 delegates signed a letter to Congress expressing worry that the regulatory machinery now being considered will be "so unwieldy and unpredictable as to inhibit severely the further development of this field of research." Much of the stimulus for the legislation seems to derive from exaggerations of the possible hazards, the letter adds (*Science*, 15 July, p. 208).

Another scientific group which has sought to persuade Congress is the Inter-Society Council for Biology and Medicine, a coalition of seven scientific societies. In a letter of 30 June to Congressman Paul G. Rogers, chairman of the House health subcommittee, the council emphasizes the "general acceptability" of the present House bill on recombinant DNA "as opposed to the current Senate

version." The legislation produced by Rogers' committee, the letter says pointedly, "will permit free scientific inquiry while protecting the health of the public."

Scientific opponents of the Kennedy bill, and Kennedy's staff differ strongly on the interpretation of the bill's requirements. Essentially the bill establishes a presidentially appointed commission within the Department of Health, Education, and Welfare. The commission would license facilities to conduct gene splicing research, and would employ a team of inspectors to visit laboratories, examine records, and monitor compliance. In the event of infringements, facilities could have their licenses revoked, and researchers could be fined up to \$10,000 a day per violation. The commission is to issue new regulations which are "no less stringent" than the present NIH guidelines. (The House bill essentially contains all the same features—licensing, inspectors, fines of \$5000 a day, and new regulations—but with the major difference that enforcement is placed in the hands of local biohazard committees instead of a federal commission.)

Opponents of the Senate bill complain that it makes the process of getting an experiment approved an intolerable struggle through layers of red tape. According to a staff member who helped draw up the legislation, but who declines to be identified, the bill simply requires that a researcher's facility be licensed, and his project registered with the commission; the only review and approval is by his local biohazards committee.

Opponents say the Senate bill creates an unwieldy bureaucracy which will spend some \$25 million to regulate a mere \$3 million of research. The Senate staff member says that the bureaucracy created by the bill comprises the president of the commission, who would be its only full-time member, and 50 inspectors. According to the congressional budget office, the cost of the regulatory apparatus will be less than \$4 million a year.

Opponents claim that the Senate health subcommittee desires to regulate other aspects of biological research, gene splicing being only a first step. The staff member states that there is no basis for this claim, and that Kennedy has no such intention.

Opponents predict that the damage caused to science by the legislation will be comparable to that done by Lysenkoism in the Soviet Union. The staff member says he heard similar predictions about the creation of the Commission for the Protection of Human Subjects in Behavioral and Biomedical Research; now that the commission is about to expire, he says, the same people are urging that it be continued.

The Senate bill on recombinant DNA has been approved in committee (although Senator Gaylord Nelson is thinking of writing a minority report) and is likely to be taken up by the full Senate shortly. In the House, the bill prepared by Rogers' subcommittee is to be considered by the committee on science and technology before going to the House floor.—NICHOLAS WADE

Engineer's Memo Stirs Doubts on Clinch River Breeder

President Carter issued a bold challenge to partisans of nuclear breeder reactors last April when, as part of his energy package, he urged that construction of the multi-billion dollar Clinch River Breeder Reactor (CRBR) be deferred "indefinitely," and that research into alternative types of reactors be upgraded. The President's principal concern about plutonium breeders such as the one planned for Clinch River is that the ex-

cess plutonium produced could be diverted to make bombs.

Carter's opposition to construction of the CRBR stirred up a fight in the Senate where, in late June, an attempt to kill the \$150-million allocation for the breeder in the fiscal 1978 appropriations bill failed in committee. However, the full Senate subsequently voted 49 to 38 to keep the Clinch River project alive. Instead of granting Carter's request to defer con-

struction indefinitely, the Senate accepted a compromise measure from Henry M. Jackson (D-Wash.) and Frank Church (D-Idaho) that delays construction for a year but provides \$75 million in new funding to continue research and support the "base of professionals" who will be needed if Congress decides to fully endorse the project next year.

The House is expected to weigh in on the Clinch River issue within days.

The Clinch River breeder has been controversial from the start but in late June trench warfare on Capitol Hill over its fate escalated to new heights with the circulation of a stinging internal memorandum by Burns and Roe, Inc., the architect-engineering firm on the project. Written in 1973 but kept confidential until now, the 42-page document is devastatingly critical of CRBR's management and argues that safety concerns have

been sorely neglected. The memorandum declares that the project's site, at Clinch River, Tennessee, is "one of the worst ever selected for a nuclear power plant."

The Burns and Roe memorandum echoed many of the problems that have been aired about the CRBR project over the years, adding support to the case for deferring construction. However, within days of the leak of the 1973 document, a new Burns and Roe statement was among Congressmen and their staffs in which the firm claimed that the problems noted in 1973 have since been resolved. But Burns and Roe's disclaimer did not dispel the doubts raised by the earlier memorandum. For one, Senator Gary Hart (D-Colo.), chairman of the nuclear regulation subcommittee of the Committee on Environment and Public Works, held a hearing on 11 July at which the memorandum was discussed.

Among the witnesses was W. H. Young, who as Burns and Roe's project manager for Clinch River authored the 1973 memo. Young testified that he has changed his mind about the safety of the Clinch River site and said, in affirmation of the firm's recent statements, "I believe that the Clinch River design is both safe and appropriate and that the project is timely and absolutely necessary." In spite of Burns and Roe's 1973 doubts about Clinch River and the way the project was being handled, the firm remained committed to its development. Young, who is now a vice president of Burns and Roe, told Congress that "... in light of information developed since 1973, I would say that it [the Clinch River project] is completely acceptable." Officials from the Nuclear Regulatory Commission and the Energy Research and Development Administration (ERDA) also testified that Clinch River will be safe and cost effective if it is built.

Nevertheless, opponents of the nuclear power project are all but certain to continue to try to use the 1973 memo to bolster their case.

The breeder has long been the centerpiece of the old Atomic Energy Commission's (AEC), and now ERDA's plans for the nation's nuclear future. Years ago, the government set out to prove to private utilities that a commercial fast breeder reactor can produce more plutonium than it can burn, and that the next generation of nuclear reactors therefore should be fueled with breeder-produced plutonium.

To demonstrate the point, the AEC decided in the 1960's on a two-pronged approach. First, the Division of Reactor

Research and Development (RRD), led by Milton Shaw, would build a Fast Flux Test Facility (FFTF) at Hanford, Washington. There it would test fast-neutron reactor environments, such as that which exists in the sodium-cooled breeder. Second, in a parallel effort, a consortium of private utilities, in conjunction with the AEC, would build a full-scale demonstration commercial reactor, complete with the capacity to generate electricity. After all, the utility companies would be the ultimate consumers for this new generation of plutonium-fueled breeder reactors.

However, a principal theme of the Burns and Roe memorandum is that the utility interests in the Clinch River demonstration plant have been neglected. The memorandum charges that the Project Management Corporation (PMC), the consortium of utilities that had been meant to actually run the Clinch River project, "is led by naive individuals who fear and accede to the AEC. . . . It is not clear that PMC is telling the utility industry its real expectations and fears about the project."

Control of the Project

Although the PMC was meant to be in charge at Clinch River, the memorandum lists several ways in which Shaw and his RRD group at the AEC had heavy-handedly taken control of the project. The AEC, according to the memorandum, was depriving Burns and Roe, as well as other contractors, of vital funds in order to bolster the cost overrun at the FFTF in Hanford. "The FFTF project's cost and schedule results are a disaster," it says, "in some measure due to AEC. There is every indication that the AEC will try to run the Clinch River project the same way as FFTF. . . . The FFTF program is . . . likely to get worse and become more of a scandal. The possible use of Clinch River funds for the FFTF could be a significant part of the scandal."

The AEC also was dictating much of the design of the nuclear portion of the plant. The AEC had "forced the use of FFTF concepts" in the Clinch River plant to such an extent that the memorandum questions whether it would be a significant advance beyond the FFTF. Moreover, AEC dictates meant that the goal of commercial demonstration was not being met. There were many aspects of the nuclear portion of the plant "which are not pointed toward scale-up for commercial use." Finally, all of this meant that the utilities were playing only a minor role in the project. According to the memorandum, utility representatives

"are starting to question why they should contribute \$250 million to add a balance of plant and steam generation to an FFTF."

The Burns and Roe memorandum also offers glimpses of the politics of the breeder program, and offers inside confirmation of some of the charges that critics outside the Clinch River program have made about it in the past. It complains at one point that the AEC bureaucracy was not keeping the firm up to date on its thinking and decisions, but indicates at another that James Ramey, one of the AEC commissioners, is, nonetheless, "our highest level contact and inside source of information." In addition, it charges that Westinghouse Corporation, which was supposed to be directing the work of Burns and Roe, General Electric, and several other firms, "is more interested in playing politics with the AEC and the schedule than in taking on the hard issues necessary and being straightforward with the utilities."

The Burns and Roe document repeatedly forecasts safety problems for the Clinch River breeder that will occur, it says, because of in-fighting between regulatory and research staffs within the AEC that cannot agree on safety standards. Both Westinghouse and Burns and Roe itself, according to the memo, "have been told orally by RRD and PMC that we should not comply with the safety requirements" already in existence. "This approach is being fostered in full knowledge that it may not result in meeting licensing requirements and that many issues would have to be taken to the AEC commissioners for resolution." (Elsewhere, a frequent criticism of the breeder and the light water reactor programs has been that safety requirements have been changing, or undefined, while important engineering and design decisions were being made.)

The memorandum lists several safety considerations on the Clinch River breeder for which there "lack specific safety criteria." Among them are the emergency core cooling system, the likelihood of a "double ended pipe break," the design of a suitable containment system for core meltdown, the effects of sodium spills and fires, and "plutonium leakage at the site boundaries."

As for the project's Tennessee site, the memorandum claims that extensive testing and analysis would be needed to see whether it is acceptable. "Varying rock conditions," "voids and cavities," and "slope stability" at the site could all make it unacceptable, it says. "The Clinch River site selected for the breeder demonstration plant is one of the worst sites ever selected for a nuclear power

plant based on its topography and rock conditions.”

However, the Burns and Roe disclaimer says that questions about the site “have been fully and thoroughly resolved.” It says, for example, that the site has been accepted by “other participants” in the project, “such as the Tennessee Valley Authority (which selected the site in 1972) as well as the Nuclear Regulatory Commission (based on its initial reviews of TVA data).”

The Burns and Roe disclaimer also argued that many of the management problems that plagued the breeder project in 1973 have been resolved (for example the rivalry between the regulatory and research staffs has been resolved by the division of AEC into ERDA and a regulatory body, the Nuclear Regulatory Commission). However, it also seems that many of the other problems identified in the 1973 memorandum have continued and possibly worsened.

On the question of the utilities’ interest in the breeder, for example, the utilities have held their financial participation to the original limit of \$250 million—while the Clinch River project’s cost has escalated yearly, to a project total of \$2.3 billion. Also true to the pattern established in 1973, it is the government, not the utilities, that has the deepest stake in the breeder, as evidenced by the fact that the AEC, and now ERDA, has absorbed these enormous cost increases.

Also, as forecast by the memorandum, delays and cost overruns on the FFTF have become something of a scandal, and now, after 9 years, construction of the test facility at Hanford has not been finished. Furthermore, the value of test results from FFTF to the Clinch River project is being more widely questioned than ever.

Finally, the delays in construction of the Clinch River reactor which was originally intended to reach criticality in 1979, have undermined the original philosophy and rationale for the project. Previous concern about diminished uranium supplies, for example, has decreased as utilities have slowed their orders for first-generation enriched uranium-fueled reactors. And greatly heightened concern about the ease with which plutonium can be diverted for weapons use has made the AEC’s plans for the “plutonium economy” based on the Clinch River breeder less popular.

What the Burns and Roe memorandum shows about the attitudes of the AEC and others toward the breeder proj-

ect in 1973 is aptly characterized today by nuclear engineer David Rose of the Massachusetts Institute of Technology. Rose, who would like to see more attention paid to other types of projects—alternative breeder designs, or solar, geothermal, or fusion research—avoids taking a stand on the merits of the Clinch River project itself. However, he says, the attitudes of many of its supporters “remind me of a dinosaur in the back garden, who says, ‘Feed me.’ And you feed him, and he grows, and grows, and says, ‘Feed me. Otherwise I will die and stink.’”

President Carter apparently is willing to let the Clinch River dinosaur die of fiscal starvation. But Congress may yet insist that it be allowed to grow.

—DEBORAH SHAPLEY

APPOINTMENTS

Morris L. Norfleet, vice president for research and development, Morehead State University, to president at the university. . . . **Elmer Washington**, dean, College of Arts and Sciences, Chicago State University, to vice president of research and development at the university. . . . **Ian W. Mathison**, professor of pharmaceutical chemistry, University of Tennessee, to dean, School of Pharmacy, Ferris State College. . . . **Tom S. Miya**, chairman of pharmacology, Purdue University, to dean, School of Pharmacy, University of North Carolina, Chapel Hill. . . . **Paul S. Salter**, professor of geography, University of Florida, to dean, College of Arts and Sciences, University of Alaska, Fairbanks. . . . **Leonard S. Lerman**, professor of molecular biology, Vanderbilt University, to chairman of biological sciences, State University of New York, Albany. . . . **Robert H. Waldman**, former chief, infectious and immunologic diseases, University of Florida College of Medicine, to chairman, medicine department, West Virginia University School of Medicine. . . . **Margaret Styles**, dean, College of Nursing, Wayne State University, to dean, School of Nursing, University of California, San Francisco. . . . **Calvin E. James**, professor of community-college education, Northern Arizona State University, to dean, School of Applied Sciences and Technology at the university. . . . **Roderick Macdonald, Jr.**, chief of ophthalmology, Medical College of Virginia Hospital, to dean, School of Medicine, University of South

Carolina. . . . **James W. Smudski**, professor of pharmacology, University of Pittsburgh, to dean, Dental School, University of Detroit. . . . **F. Karl Willenbrock**, director, Institute for Applied Technology, National Bureau of Standards, to dean, School of Engineering and Applied Science, Southern Methodist University. . . . **Kenneth Wing**, chairman of agricultural and resource economics, University of Maine, Orono, to dean, College of Life Sciences and Agriculture at the university. . . . **Thomas J. DeMarco**, professor of periodontics and pharmacology, Case Western Reserve University, to dean, School of Dentistry at the university. . . . **M. Alton Hodges**, acting dean, School of Allied Health Sciences, University of Texas, Houston, to dean of the school. . . . **Ralph Kaslick**, professor of periodontics and oral medicine, Fairleigh Dickinson University, to dean, School of Dentistry at the university. . . . **Alban Wheeler**, chairman of sociology, Morehead State University, to dean, School of Social Sciences at the university. . . . **Robert E. Burridge**, professor of engineering, University of New Brunswick, to dean of engineering at the university. . . . **Eugene D. Furth**, associate chairman of medicine, Albany Medical College, to chairman of medicine, East Carolina University. . . . **Charles M. Leslie**, professor of anthropology, New York University, to chairman of anthropology, University of Delaware. . . . **John A. Ryan**, chief, environmental sciences branch, McDonnell Douglas Astronautics Company, to chairman of earth sciences, California State University, Fullerton. . . . **Michael Taylor**, associate professor of psychiatry, State University of New York, Stony Brook, to chairman of psychiatry, University of Health Sciences, Chicago Medical School. . . . **Edward A. Smuckler**, professor of pathology, University of Washington, to chairman of pathology, University of California, San Francisco. . . . **Richard J. Sauer**, associate professor of entomology, Michigan State University, to chairman of entomology, Kansas State University. . . . **Paul Szaniszlo**, associate professor of microbiology, University of Texas, to chairman, biological sciences division at the university. . . . **Gerald H. Cross**, assistant professor and wildlife specialist, Virginia Polytechnic Institute, to head, fisheries and wildlife sciences department, School of Forestry and Wildlife Resources at the university. . . . **Walter F. Freiburger**, professor of applied mathematics, Brown University, to chairman, applied mathematics division at the university.