look for other ways to support both their trainees and their teaching faculty.

Among alternatives that have come up, but that appear to be less acceptable to the medical community than the present system, are these three:

► A guaranteed loan program.

► A work-study program in which the government would support training through research grants. Under this system, students would be employed to work on specific research projects. An argument against this approach is that it would limit the scope of an individual's training.

► A departmentally related research allowance. Research departments would receive awards for training in proportion to the amount of research grant money they have. The NIH would "only endorse this proposal as a retreat position," according to its position paper for the OMB.

In spite of the fact that the end of traditional training programs has been in sight for some time, reports that there will be no "new starts" have taken the biomedical community by surprise. Some medical school leaders fear that a few schools may go under if they lose support as early as next year. Others, including Merlin K. DuVal, vice-president of medical affairs at the University of Arizona at Tucson and former assistant secretary for health in the Department of Health, Education, and Welfare, thinks such fears are greatly exaggerated. However, DuVal believes, there is no question that medical schools will be hurt if the training support is pulled out too quickly.

The amounts of money involved are significant, and even the strongest of medical schools will have to do some serious thinking about how to handle their resources and make choices if the training funds dry up. Albert Einstein College of Medicine in the Bronx is reported to receive approximately $1.6 million a year for stipends and another $2.7 million in institutional support, including faculty salaries. That money all comes through training grants. Paul Marks, vice president of medical affairs at Columbia University, reports that his institution gets about $1.2 million a year through training grants for faculty salaries as well as a large sum for stipends. The situation is similar at other schools.

Unless some other mechanism of student and faculty support comes into play soon, medical leaders are saying, things are going to be "fantastically difficult," as Louis G. Welt of Yale University puts it. Welt, president of the Association of Professors of Medicine, says that training program cuts knock the whole financial substrate for training teachers and researchers out just at a time when the nation is demanding more output, both in clinical and research areas. And that seems to be what the academic physicians and investigators are really worried about.

If there is any hope in their minds that training support will be rescued, it seems to center on the Congress. Already, a variety of scientific groups have been in touch with Congressmen. Paul G. Rogers (D–Fla.), whose interest in health matters is well known, has heard from what a spokesman called a "considerable number" of scientists and will inevitably hear from more. According to one of Rogers' aides, cutting training programs is "evidence of false economy" within the Administration, reflecting a desire "to cut dollars today to make the tally book look good" without regard to the long-term effect of such maneuvers. "Remember," he said, "the budget is only a recommendation from the President. I doubt the Congress will go for it."

The question is whether it will really make any difference in the end if Congress does try to put back money the President has taken away. Even if it does, the funds might get lost in the OMB anyway.—BARBARA J. CULLITON

Nuclear Safety: AEC Report Makes the Best of It

With a little prodding from Congress, the Atomic Energy Commission has prepared a major report on the safety of nuclear power. The report is expected to be the centerpiece of congressional hearings on nuclear safety planned by the Joint Committee on Atomic Energy (JCAE) later this winter. Once the hearings are over, the AEC intends to publish its report as part of a stepped-up public relations effort to counter growing opposition to the construction of nuclear power plants.

Fourteen months in the making, the safety report—at least in its final draft version—runs 600 pages and weighs 3 pounds. Much of it is taken up with a bland and reassuring discussion of the AEC's regulatory process, the design of nuclear power plants, and the elaborate precautions taken to ensure their safety. Nevertheless, the report contains one revelation that a number of the AEC's outside critics consider startling at the least. In a discussion of the highly controversial matter of accident probabilities, the report estimates that the chances of a nuclear power plant suffering a serious accident and a consequent release of radioactivity may—for a given reactor in a given year—be as great as one in a thousand. Coupling this estimate with the AEC's projection that about 100 power reactors will be operating in the United States by 1980 and 1000 by the end of the century, the report indicates that one such accident each year may become a virtual certainty.

Hitherto, the AEC has maintained that the chances of a serious "loss of cooling" accident of this sort were so hard to calculate and were undoubtedly so small in the first place as to defy meaningful estimation. The phrase commonly used to describe such an accident is "extremely unlikely."

Moreover, the safety report presents an estimate by non-AEC researchers that the chances of a reactor's massive steel pressure vessel rupturing catastrophically may be on the order of one in a million in any given year. Both the AEC and the nuclear industry have traditionally regarded the explosive rupture of a pressure vessel—the "pot" containing a reactor's core of nuclear fuel—as "not credible," which is to say, all but impossible; indeed, the thick concrete containment shells that surround power reactors are not de-

signed to withstand such an accident.

Lest all of this seem a reversal of the AEC's confidence in reactor safety, however, it should be noted that the report's discussion of these estimates devotes itself mainly to stringing them with some weighty caveats. For example, the accident with one chance in a thousand of happening is assumed to release no more than 10 curies of biologically harmful radioactive iodine, an amount asserted harmless to the surrounding population—although the reactor itself certainly could suffer severe damage, with the cost ultimately being borne by the utility customers. The chances of an accident involving a "catastrophic" release of 5 million curies of radioactive iodine are set at less than 1 in 100 billion, which is to say, "extremely unlikely."

All of these estimates, the report asserts, are to be viewed as "brillant, imaginative, pioneering efforts" at predicting disaster that incorporate so many "simplifying assumptions" that only two conclusions are possible—that the results are too suspect to be believed, or that the underlying assumptions grossly "overstate reality" and the real risks to individuals are negligible.

It should also be noted that these probabilities were cribbed from a 1970 engineering publication [H. J. Otway and R. C. Erdmann, *Reactor Siting from a Risk Viewpoint* (North-Holland Publishing Company)] and did not come from the AEC's own research. The agency's first serious stab at such calculations, a study contracted out to the Massachusetts Institute of Technology, is due to be completed in 1974.

The safety report was requested in October 1971 by Senator John Pastore (D–R.I.), then chairman of the JCAE. As Pastore envisioned it, the report would present a broad evaluation of reactor safety with the intent of "setting down for the industry and the public a clear-cut summary of what the facts are in this matter." At that time, an internal AEC debate over the adequacy of the emergency core cooling systems (ECCS) in nuclear plants had burst into public view and the commission was contemplating a precedent-setting "rule-making" hearing on the issue that was to run intermittently for nearly a year. (The ECCS hearing ended last month after accumulating 22,000 pages of oral testimony.)

The Joint Committee provided only minimal guidance to the AEC in writing the safety report, but it did suggest some general goals. For one, it said, the report should at least partly satisfy the demands of critics for "full disclosure" of matters affecting reactor safety. Further, the AEC was instructed to examine the adequacy of the "technical substantiation" behind its claims, and those of industry, that nuclear plants were being operated without "undue risk" to public safety, as federal law requires.

It is probable that the Joint Committee knew at the time that the AEC was hard at work revising its plans for reactor safety research to place what the commission staff called urgent emphasis on the troublesome issue of backup cooling systems. An AEC outline of this redirected research, dated November 1971, conceded that information then available on the performance of emergency core cooling systems was "not now sufficient to provide the degree of ECC assurance deemed necessary by the AEC."

Interestingly, the commission's new safety report contains no such concession, although the augmented research outlined in the fall of 1971 is nowhere near completion.

Reviewers Disagree

Since this past December, the AEC has circulated about 50 copies of the draft report to a select group of reviewers, including both critics and the corporate giants of the nuclear industry. Not surprisingly, the question of whether the report met Pastore's high-minded objectives is already a matter of sharp disagreement. The trade magazine *Nuclear Industry* has praised the report as objective and well written. Daniel Ford, a Cambridge economist who played a prominent role in the long ECCS hearing last year as chief interrogator for the environmentalists, says he thinks the report is a "superficial public relations document" that fails to reflect the strong dissenting views of a number of safety researchers within the AEC. And indeed, one such researcher called described it as a "whitewash," while another pronounced the report as "not worth reading, in its major parts." Both asked not to be identified.

Two other reviewers—Chauncey Starr, dean of engineering at the University of California at Los Angeles, and Ralph Lapp, the author-physicist—were reluctant to discuss their critiques of the report until the AEC had a fair chance to study them. Both, however, said they felt the draft report failed to treat key safety issues in sufficient detail or with adequate balance.

Some would say that this outcome is not surprising. As it happens, the report was written almost entirely by headquarters staff at Germantown, Maryland, under the supervision of Milton Shaw, the AEC's controversial chief of civilian reactor programs (*Science*, 1, 8, 15, and 22 September 1972). Knowledgeable sources said only minor contributions were invited from Oak Ridge National Laboratory or from the National Reactor Testing Station in Idaho, the two facilities responsible for most of the AEC's safety research. Shaw's management of the reactor safety program has been the target of bitter criticism from the two laboratories, but the report's only reflection of internal dissent on this or any other matter is the statement that the average citizen may find it hard "to judge who is right when scientists differ on such a subject" as reactor safety.

Much of the report's long explication of safety philosophy and reactor design conveys the tenor of mid-Victorian parents telling children about sex: the language is delicate and circumspect, the exposition not very illuminating. Still, there are discreet hints to be found that all is not well.

At one point in the second of seven chapters, for instance, the report concedes that nuclear plants do experience "incidents" and breakdowns, which, though not reported to the public, must, by law, be reported to the AEC. Noting that these malfunctions have posed no danger to the public or to reactor operators, the report goes on to say:

> The number of defects, equipment malfunctions, or failure events that have been encountered during construction, pre-operational testing and routine nuclear power operations to date has been large, attesting to the fact that there is considerable room for improvement in practice, if not in philosophy.

Although the reader is referred to a list of reactor "incidents," published by the Oak Ridge National Laboratory, they receive no further discussion until the third chapter, where several problems currently receiving "additional attention" from the AEC's regulatory staff are listed, again without amplification:

> ► Utility management, for the most part, has been slow to recognize the distinction between the organization and controls required to operate a nuclear power plant and the traditional controls employed in operating fossil fuel plants.

► In a number of cases there appears to have been insufficient management participation and involvement in the day-to-day operation of the facility—particularly in safety related activities.

► Fully effective quality assurance programs have not been sufficiently developed or implemented.

One page later the report notes that fuel rods in some nuclear plants are not holding up as well as "anticipated or desired," and that some of the fuel rods are leaking a bit more radioactive waste than they should be. It is left to the reader to learn elsewhere that severe and unexpected damage to fuel in several reactors has been the subject of a major investigation by the AEC regulatory staff for the past 6 months and is expected to lead to temporary cuts in the permitted power output at a number of nuclear plants. Thus, oddly, the report plays down not only the seriousness of fuel problems but also the presumptive caution that the AEC has exercised in handling the matter.

Similarly, several other past and current problems receive glancing, if not cryptic, mention with no attempt to explain their implications for public safety. For instance, it is noted that a "relatively large number" of valves in reactor safety systems have malfunctioned over the years. The gravity and extent of these malfunctions, however, may be somewhat greater than the report's one-sentence reference suggests. Last July, two workers at the Virginia Electric Power Company's Surry nuclear plant were killed in the act of inspecting a set of malfunctioning valves when still another valve exploded. (An AEC investigation attributed the explosion to improper design in a piping system, another generic problem that has recently reared its head in the reactor business and which receives only oblique mention in the commission's comprehensive safety report.)

Moreover, before and since the accident, AEC regulatory officials have been conducting the nuclear equivalent of an automotive recall, in a nationwide search for potentially defective valves of a type widely used in "safety-related systems." In letters to a number of utilities, the AEC has asked reactor operators to search their records to determine whether or not the metal walls of the valves in question are—as suspected—thinner than safety standards allow. To the dismay of regulatory authorities, some utilities are having a hard time determining whether their plants use the valves at all, much less whether the valves are defective.

Still another investigation under way, and one not mentioned in the report, concerns the placement of the huge steam lines that connect power reactors with nearby turbines. An anonymous letter alerted the AEC last fall to the fact that a steam line of the Northern States Power Company's nearly completed Prairie Island plant in southern Minnesota snaked through an auxiliary building housing vital safety equipment. With the belated thought that a rupture of the steam line might cripple the plant's ability to control subsequent events, the AEC is thinking about ordering Northern States to move its line. The AEC is also asking other utilities to look for similarly placed lines, and

Moss Heads Senate Space Panel

The Senate seniority system allows few surprises, but the reshuffle of committee assignments at the beginning of the new Congress has produced at least a mild one with the naming as chairman of the Senate Aeronautical and Space Sciences Committee of Senator Frank E. Moss (D–Utah), who has never served on the committee before. As it happened, all the eligible Democrats serving on the space committee would have had to give up desirable assignments on other committees to assume the chairmanship and were unwilling to do so. By moving to the space committee, Moss, who was elected to the Senate in 1958, gets his first chance to head a major committee.

Moss, who succeeds retired Senator Clinton P. Anderson (D–N.M.) in the chairmanship, is hardly a random choice for the post. Moss served in the Judge Advocate's branch of the Air Corps during World War II and retired a few years ago as a colonel in the Air Force Reserve. In the Senate he serves on the Commerce Committee's subcommittee on aviation. He has been a staunch supporter of the space program and backed the space shuttle.

In a statement made when he took the chairmanship Moss noted that "Aerospace is important to this country. It is the leading industry in Utah and, therefore, of vital interest to my constituents. A spokesman from Business Research at the University of Utah advised me that there are 19,000 jobs dependent upon aerospace industry in Utah."

In view of cuts in the space budget and lowered horizons for NASA there has been speculation that the space committee might not continue as a major Senate committee. The appointment of Moss as chairman appears to remove the question.

The space committee chairmanship had been expected to go to Senator Stuart Symington, who does not hold a major committee chairmanship. Symington is the only senator to hold membership on both the Armed Services and the Foreign Relations committees, however, and was unwilling to give up membership on one of the committees, as the rules require, to assume the space committee chairmanship. The remaining Democratic members of the committee, senators Warren G. Magnuson of Washington, John C. Stennis of Mississippi, and Howard W. Cannon of Nevada all now head major committees. Moss gave up his membership on the Interior committee to take his new post. Also going to the space committee as a new member will be freshman Senator James Abourezk (D–S.D.).

Moss reportedly is looking for ways to make the space committee more active, particularly in matters of science and technology, and is said to be contemplating changes in the committee staff. As a "science" committee, Senate rules give the space committee jurisdiction over scientific aspects of aeronautical and space activities in NASA and other civilian agencies and, to a limited extent, the military services. The committee's purview, however, is currently more circumscribed than that of its counterpart committee, Science and Astronautics, in the House of Representatives, which, for example, is the legislative committee for the National Science Foundation.—J.W.

the result may be some very expensive new plumbing in several plants, with the bill likely to be passed on to consumers.

To some analysts, the steam line problem bespeaks a poor quality of systems engineering in reactor design, a subject not broached in the safety report. In any case, how this problem escaped the commission's elaborate process of safety review remains a mystery.

It may be true, as the AEC claims, that such difficulties are the predictable growing pains of a burgeoning new technology. It remains to be shown, however, that the industry's difficult puberty has not endangered the safety of the public—or the success of what ultimately is a multibillion dollar investment by the public in a complex new technology. Nor does AEC's safety report attempt to refute the critic's argument that growing pains in a potentially dangerous technology argue for slower growth.

The JCAE is under considerable pressure, from within and without, to address such questions. Not the least of the external pressures comes from consumer advocate Ralph Nader's recent entry into the fray, with a vow to go to the courts, to Congress, and to the stockholders of the nation's utilities with the message that nuclear power is riven with "bad economics, dangerously immature science, and incestuous politics."

Whether the usually friendly Joint Committee is up to the task of a trenchant inquiry into reactor safety is another question. But certainly its job was not made any easier by an imperious self-analysis that concludes with the thought that nuclear safety is a subject of controversy today partly because of a "growing mistrust of technology" and partly because government and industry efforts at disseminating "public information" have been insufficient.

—ROBERT GILLETTE

Alcoholism: On-the-Job Referrals Mean Early Detection, Treatment

The development, over the past few years, of alcoholism programs for employees in both government and industry could turn out to be a giant stride in the history of preventive medicine. There have been no dramatic breakthroughs in treatment. What is happening is the result of increasing awareness that it is possible to identify and treat a victim of alcoholism—one of the four most serious diseases in this country—years before he has become skid row material.

For some two decades, the experts have claimed that alcoholism is a disease. But it has not been treated as such by physicians, psychiatrists, hospitals, insurance companies, employers, or the public at large. Most people now know it's a disease, but they still don't believe it.

The past few years, though, have seen some changes. One of the most significant advances was the passage in 1970 of the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment, and Rehabilitation Act, otherwise known as the Hughes Act [named for its sponsor, Senator Harold Hughes (D–Iowa), himself a recovered alcoholic]. This act transformed the National Center for Prevention and Control of Alcoholism into the higher-level National Institute on Alcohol Abuse and Alcoholism (NIAAA) and authorized the expenditure of $300 million over 5 years—a gigantic increase over the center's annual budget of about $5 million, most of which went into basic research. Now the emphasis is moving into applied studies and treatment.

Only about 5 percent of the nation's alcoholics are of the down-and-out, derelict variety. Most of the rest hold jobs and make up 4 to 8 percent of the total work force. The Hughes Act recognizes this fact. It has directed the Civil Service Commission, the nation's largest employer, to get all government agencies to set up programs for their employees. In addition, there has been established an Occupational Programs Branch within the NIAAA that gives grants to states for the training of "occupational program consultants." Two individuals from each state are trained by the government and then unleashed to, respectively, help set up state and local employee programs and encourage private companies to get into the act.

"The NIAAA Occupational Programs Branch has shifted the emphasis from skid row alcoholism to where it really is—namely, next door, down the street, and in the office," says Harrison Trice, professor of industrial and labor relations at Cornell University who has done research and consulting on alcoholism and employee health since the mid-1950's.

Private entities, such as the Christopher D. Smithers Foundation of New York, the Cornell Center for Occupational Health and Alcoholism, and the National Council on Alcoholism (NCA), have for years been promoting research and education in this field.

Now it appears that all these efforts are beginning to bear fruit. Employee alcoholism programs require little in the way of new money or added personnel. Programs rely on a variety of community resources, the chief of which is Alcoholics Anonymous (AA), and are usually set up as part of an organization's personnel department or health division. If a company's employees are unionized, procedures are generally decided upon by a joint union-management committee. In any case, the support of top management is essential.

The biggest difficulty in the treatment of an alcoholic is motivating him to seek help. For this purpose, as Trice points out, no one is in a better position than his employer, who has the power—through the threat of firing or demotion—to intervene in a worker's life, as well as the right to do so once the problem begins to interfere with his work. Neither logic nor tears has the same effect on a problem drinker as the fear of losing what may be his last link to respectability—his job.

Company procedures vary, but most follow the principles set out by the NCA's labor-management committee, which was established in 1969. First, in a company where unions are in-