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Nuclear Reactor Operation

With all due respect for Kenneth S. Pitzer (Letters, 22 June, p. 1263), I would like to comment on organization for safe reactor operation. As one long associated with the achievement and regulation of reactor safety, I know that an acceptable level of risk cannot be achieved by reliance on reactor operators alone, licensed or not.

First, all reactor safety systems should be, and most are, designed to shut the reactor down automatically and immediately, given a condition that could in any way pose significant risk to the equipment, the operating personnel, or the public. Second, redundant and diverse means always are provided to the operator (licensed or not) to initiate such automatic or manual action. What is different for reactors than for aircraft and ships is that these procedures and actions can be and usually are carefully thought out and demonstrated ahead of time—before incidents occur. While several operational errors appear to have taken place in the sequence of events at Three Mile Island, there probably would have been no accident had the plant been operated in accordance with the technical specifications of its license (that is, the valves in the auxiliary feedwater lines were closed when they shouldn't have been during reactor operation). This situation apparently prevailed for at least several days. Perhaps it can be argued that higher standards for education, training, and pay for licensed operators would have precluded this operating condition, but, in my opinion, they would have been totally irrelevant. The only way that an acceptable level of risk can be achieved to conform with the public (and media) perception of that risk compared to already (much greater) accepted risks, is to demand that this risk level be achieved independently of the actions or decisions of any single operator, licensed or not. This can be achieved only by insisting on a number of things, the most important of which is competent management of the operating organization. Corporate management is responsible for safety, just as it is for return on capital investment. Any competent management knows that safety is good business (look, for example, at duPont's 150-plus-year-history in the manufacture of explosives and toxic chemicals). The violations of the technical specifications of the license that took place at Three Mile Island might be ascribed to operator error, inadequate operator licensing requirements, or inadequate training. This would be unjustified. Complying with license requirements is a management responsibility.

The eminently safe nuclear operations in the United States during the development and application of high-powered reactors was accomplished by the duPont Company (the design, construction and operation of the Hanford and Savannah River weapons materials production plants), Phillips Petroleum (operation of the first test reactors at the National Reactor Test Station in Idaho), and the Navy nuclear program under Admiral Rickover. The one distinguishing feature among these very diverse nuclear activities is that each had an organization devoted to safety and technical matters completely separate from that charged with day-to-day operation and maintenance of the facilities. This concept, and its importance, has been increasingly recognized by the U.S. nuclear utilities in recent years, but its full acceptance and implementation has been inhibited by state public utility commissions (motivated by perceived consumer interest) who want to reduce utility expenses and consumer costs by minimizing the utility staff, a traditional reliance of the utility on its supplier, and the fact that individual reactor operator licensing is required by the Atomic Energy Act, to the detriment of a real appraisal of the competence of the licensee organization and management.

The importance of a strong independent technical staff, if not on site or on immediate call, cannot be overemphasized, compared to the impractical requirement of using highly trained operators to perform routine and boring operations for days on end. Should human ingenuity be required—and I believe Three Mile Island underscored that desirability—the combined expertise of a multidisciplinary technical support group, subject to existing management organization and discipline, is clearly superior to that of a "reactor captain."

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Having also been a member of the General Advisory Committee to the U.S. Atomic Energy Commission, I wish to add a few words to Pitzer's letter.

I fully agree with him—we do need "reactor captains" with a deeper knowledge of the functioning of the reactor. But there is another problem with reactor supervising: for days and days the reactor shows no sign of irregularity, and the captain has nothing to do except watch for the occurrence of some irregularity. He becomes bored and, after some time of boredom, pays too little attention to possible signs of trouble. I can relate amusing stories of such behavior—principally, I admit, of guards, not reactor supervisors. But, for the reasons mentioned, it would be important to keep the supervisors awake. This is not a technical problem and requires an understanding of human nature. I propose that supervisors not be left at the same job for too long; that they be asked, quite frequently, to review their experiences to a group of colleagues; and that they participate in regular get-togethers with colleagues and others. I believe such measures would help keep them interested in their functions and also keep them more awake.

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