

A Nuclear Watershed

Safety reemerges as a major issue in the nuclear debate to challenge the nuclear power industry as never before

BY JANET RALOFF

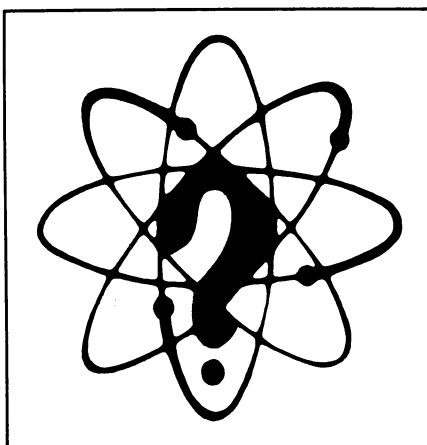
The year is barely half over and already 1979 has dealt the nuclear-power industry and its advocates several serious blows. The result, according to the nuclear industry and its critics alike, has been to bring safety issues — which had been eclipsed by growing dissatisfaction with radioactive waste management — fore again in the continuing nuclear debate.

The chain of events was kicked off on January 19 when the Nuclear Regulatory Commission announced it was withdrawing its endorsement of major portions of a five-year-old reactor-safety study known alternately as the Rasmussen Report and as Wash-1400 (SN: 1/27/79, p. 55). The action followed a technical, and in places severely critical, evaluation of the study by a panel of experts commissioned in 1977. "Nuclear proponents have for years used the study to assure the public that nuclear power is safe. [NRC] has now made clear that the report is useless for this purpose," said Morris K. Udall (D-Ariz.), who chairs the House Interior subcommittee with oversight of nuclear regulation.

Next, on March 13, Harold Denton, NRC's director of nuclear-reactor regulation, announced that his agency would shut down five nuclear plants designed by the firm of Stone and Webster (SN: 3/24/79, p. 184) after discovery of an algebraic error in computer-design codes used to calculate seismic stresses on in-plant pipes. The shutdown, which it has been estimated could last as long as six months, cost 13 million affected customers about \$400,000 a day for replacement fuel.

Then came a staggering blow — the accident that led to the catastrophic crippling of the Three Mile Island nuclear plant on March 28 (SN: 4/7/79, p. 227). Said one nuclear expert, "Three Mile Island is a watershed event for nuclear power — there's no doubt about it." Said a utility engineer, "It makes you wish 1979 never happened."

In the wake of these events, what is the near-term outlook for nuclear power? "For the short term, highly volatile and uncertain, for the long-term — dead," says Peter Franchot of the Union of Concerned Scientists, a Cambridge, Mass.-based group critical of nuclear safety. Carl Goldstein, spokesman for the Atomic Industrial Forum, exhibits more optimism. Speaking for the nuclear industry, he says electric utilities have been understanding and supportive. Although none have yet can-



celed orders to purchase new plants as a result of the accident, he says, "I'm sure most utilities want to wait until all questions about Three Mile Island are answered before they order future plants. It has cost us some momentum."

That momentum was expected to revitalize an ailing industry. In the last four years, U.S. utilities have ordered only nine new plants from the nation's four commercial vendors — three in 1976, four in 1977 and two in 1978. This represents a dramatic downturn from the 41 ordered in 1973 and the 26 ordered in 1974. In part the slack in new orders represents a reassessment of the growth in electrical demand for the coming decades, but Goldstein admits that nuclear-plant vendors have suffered disproportionately compared with their counterparts in the coal industry.

More than anything else, Three Mile Island appears to have driven regulators into a period of introspection and anxiety over safety matters. There had always been a number of unresolved safety questions. In fact, NRC had compiled a list of more than 200. By January 1978, the agency had reduced the number to 133. This year's list as reported to Congress numbers only 19.

"It would appear that [NRC] made some progress," says Robert D. Pollard, a former reactor-licensing engineer for NRC and now a staff member of the Union of Concerned Scientists. Pollard claims that contrary to appearances, NRC has not eliminated the unresolved questions so much as administratively redefined them under alternate headings such as standards activities, policy matters, normal work, case work and implementation. Pollard cited examples, including several relating to the Three Mile Island plant:

- Sharing hydrogen recombiners is no longer an unresolved issue but a standards activity, Pollard says. ("You'll recall," he added, "that during the accident at Three Mile Island they had some difficulty

with their hydrogen recombiners because the amount of hydrogen present and the level of radioactivity in the atmosphere was higher than the recombiners had been designed to handle.")

- The review of how well computers model emergency (reactor) core-cooling systems is now handled as normal work.

- Siting policy, fixed-area radiation-monitoring instrumentation and the performance of safety equipment during a design-basis accident are all standards activities.

- Fire protection is no longer unresolved "because NRC thinks it knows what it's going to do. It just hasn't done it yet. So that's called an implementation item," Pollard explains.

- Stress-corrosion-cracking problems in boiling-water reactors also fall into the implementation category.

- Nuclear-reactor-regulation research needs are classified as normal work now.

- Environmental qualifications of safety equipment "is one good example of an unresolved safety problem that is still on the list of unresolved safety items," Pollard adds. "What that means, in a nutshell, is can safety equipment operate in the environment created by the accident for which that equipment is supposed to provide protection? We saw at Three Mile Island the failure of equipment when it was exposed to the radiation inside the containment [building]. There were failures of the pressurizer-level instrument and containment-sump-level instruments."

- Another unresolved item is post-accident instrument monitoring. "In a pressurized-water reactor, a large number of the safety systems are devoted to the sole purpose of making sure the reactor fuel is kept covered with water," Pollard explains. "But in spite of that, there's not a single [direct] method of measuring whether or not those systems have accomplished their function because there is no way to measure the water level inside the reactor." He says even NRC's Advisory Committee on Reactor Safeguards investigation of Three Mile Island noted the deficiency in its recommendation that NRC consider "expeditiously the provision of instrumentation that will provide an unambiguous indication of the level of fluid in the reactor vessel."

"But I think the main lesson to be learned from Three Mile Island is that we cannot rely on computer predictions," Pollard concludes. He says computer predictions showed that for the worst possible accident, no more than one percent of the metal in the core would react chemically with water to produce hydrogen. "In fact," he says, "at Three Mile Island, a rather trivial accident, somewhere on the order of 25 to 30 percent of the metal reacted



Metropolitan Edison Co.

Three Mile Island #2 control room in quieter times. Five operators normally run it.

chemically to produce hydrogen. And that's what led to the explosion inside the containment building."

Pollard adds that even resolving safety issues does not necessarily mean eliminating them. Quoting from a letter to NRC Chairman Joseph Hendrie from the chairman of the agency's independent ACRS in 1977, the term "resolved" when used in reference to formerly unresolved safety issues can mean "an item has been resolved in an administrative sense, recognizing that satisfactory implementation [of the solutions is] yet to be completed."

The Atomic Industrial Forum plays down the significance of the unresolved-issues list. Conceding that NRC is "still agonizing over" that list, Goldstein says that "most of those so-called unresolved issues are not in any way important." If they were, NRC would have shut existing plants down, he says.

Not necessarily, Pollard argues. Prior to Three Mile Island, whenever NRC developed new safety requirements, they were applied to existing plants with "understanding and flexibility"; that is to say, not all were put into existing plants. Calling this one of NRC's "catch 22's," Pollard says there's no reason to suspect that NRC will shut existing plants down just because it identifies a serious safety-related problem. And unlike Goldstein, Pollard considers many of NRC's unresolved problems serious.

Changes do appear to be in the offing, however. Earlier this month Harold Denton said publicly that he wouldn't be surprised if the President's Commission on the Three Mile Island accident (SN: 5/5/79, p. 292) recommends upgrading all existing U.S. reactors to meet current NRC safety standards.

In addition, NRC's task force on lessons learned from the Three Mile Island accident will recommend that the agency im-

plement more than 30 short-term measures from a preliminary report the task force will issue this month. A final report is expected in September. Recommendations are already being called "hot coals" to connote the urgency with which the task force feels they should be adopted.

Among the "burning coals" — presumably these are the most urgent recommendations — that NRC plans to drop on the nuclear industry is a rule requiring that any plant operating error causing a "loss of safety" must trigger an automatic shutdown of the plant. And the reactor would remain out-of-service until the problem was corrected to NRC's satisfaction.

The measure, described at an ACRS briefing by NRC's Roger Mattson, who heads the "lessons learned task force," is a "punitive action," which Mattson called "commensurate with the size of the problem." Among situations that could trigger such a shutdown are loss of emergency feedwater (as occurred at Three Mile Island), emergency power or low-pressure emergency core cooling.

The shutdown threat "is a way of requiring people to put attention and resources and management clout behind operator reliability," Mattson said in the July 19 NUCLEONICS WEEK. Mattson added that the shutdown would serve as a cornerstone of three short-term measures to improve operational reliability. NRC now lacks the power to order such shutdowns.

Among other hot coals is a proposal to change reactor-operations management. Within a year, utilities would be required to place safety engineers "in close proximity to the control room," Mattson said. And within two to three years, on-site control room engineers may have to have engineering degrees, he added. In the past, utilities have met such proposals with criticism, saying it would be almost impossible to find and train so many en-

gineers quickly. Most engineers would also find the job too boring to accept, they assert.

Upgrading post-accident monitoring is another burning coal coming out of the Three Mile Island investigation. Mattson said indications of radioactive iodine in the control room were erroneous and resulted from an inability to differentiate between iodine and noble gases. New steps would improve iodine measurement inside the plant and in waste effluents. Radiation readings that "ran off the scale" at Three Mile Island will be eliminated, NRC hopes, by extending the upper-range monitoring capability of instruments.

Installation of hydrogen recombiners in all operating reactors is a "lone minority recommendation," according to the NUCLEONICS WEEK report. If adopted, 46 of the 70 operating plants would have to be capable of installing the devices within days after an accident to control potentially explosive hydrogen levels in the reactor's protective containment.

Another proposal calls for development of a test program for relief and safety valves, which would be available to plant operators by 1982.

Critics of nuclear power suggest that the added costs of these and other safety changes inspired by the Three Mile Island scare will further erode the utilities' confidence in nuclear power.

Perhaps more important, this rekindling of safety issues at the federal level is expected to spawn safety-related debates at state and local levels where a grassroots political force is growing with antinuclear interests as its central theme. It's such a movement that — using radioactive-waste-storage issues as its focus — rallied support for legislation that has banned waste storage in 11 states and has halted any new construction of nuclear plants in six more until the technical uncertainty over permanent-waste-disposal issues is resolved.

A steady stream of retroactive safety measures for existing plants could "nickel and dime" utilities to death, said one reactor-design engineer who asked to remain unidentified. The problem, he said, is that they're badly needed. Nuclear power is too technically dependent to be left in the charge of unionized operators having only a high-school education, as it often is, he said. But having engineers in the control room isn't the answer either, he adds, saying that no crew could handle the hundreds of blinking lights, buzzers, dials and buttons that demanded the attention of operators in the early hours of the Three Mile Island incident. He suggests that better human engineering of control rooms and computer control of more systems is necessary if tragic complications as occurred during that accident are to be avoided. The real problem, he laments, is that safe nuclear power is achievable, but only at a dollar and engineering cost no utility is yet willing to invest. □