

recent years many utilities have earned only 11 or 12 percent on their capital while being forced to borrow money to finance expensive powerplant construction at 16 and 17 percent. "You can do that for a while," he says, "but after too long you go broke. And that's exactly what was happening."

With no new domestic orders for nuclear plants and none imminent, reactor manufacturers have also been hurting. Westinghouse, one of the nation's four reactor vendors, has survived by retrenching its manufacturing operations and increasing its engineering force. Observes James S. Moore, Westinghouse vice president and general manager of its water-reactors division, "I like to tell my people [he has 9,200 under him] that we're not a supplier of new nuclear plants today. We're into service — helping utilities [that already own reactors] make sure those plants operate well." Other reactor makers are doing the same, Moore says, while waiting for utilities to begin buying reactors again.

Another thing that has helped Westinghouse's nuclear division survive has been finding alternate work for its reactor-manufacturing plants. One plant in Pensacola, Fla., now produces submarine hulls. Moore's division has also taken on high-quality aluminum-plate machining of components used on shipboard vertical missile launchers. But this is only a temporary stopgap. Moore says, "If the basic [reactor manufacturing] business doesn't come back in the next 3, 4, or 5 years, you've really got to question where we're going."

Nuclear is not the only power industry in trouble. "I understand no new generation [including coal] has been built at all in 1982 by U.S. utilities," Moore told SCIENCE NEWS. "That's the first time that's happened, I think, since the early '30s." But most expect coal sales will dominate when utilities are forced to get back into ordering new generating capacity, probably around 1987.

MacKenzie thinks a continued pause in nuclear sales might actually benefit the nuclear industry. He says the industry needs time to stabilize its economic situation and to iron out some generic-safety problems such as pressure-vessel embrittlement plaguing older plants (SN: 6/20/81, p. 390), poor valves that still fail as they did at TMI-2, and corroding steam-generator tubes (SN: 2/13/82, p. 105). The industry also needs time to "get people like us [critics] to agree that the problems are convincingly solved," and time to restore public confidence with years of safe, mundane commercial operation.

But "the most immediate problem the nuclear industry faces is getting its quality-control act together," MacKenzie claims. Over the past two years, the Nuclear Regulatory Commission has identified a number of reactors having serious problems involving their designs and/or

construction. For instance, the low-power (preliminary) operating license was suspended for the \$2.3 billion Diablo Canyon-1 plant in Avila Beach, Calif., in November 1981 pending verification by an outside consultant that steps had been taken to correct 13 errors in design and construction — including one error in the plant's earthquake-safety system. Then in March 1982, NRC inspectors announced finding another 111 errors and possible errors at Diablo Canyon — calling into question whether there had been a "fundamental breakdown in the quality of the design process," according to Harold Denton, NRC's director of regulation.

Similar suspicions over construction quality prompted NRC to order construction audits of the South Texas-1 plant in Matagorda Co., at the William Zimmer-1 reactor outside Cincinnati, and at the Marble Hill-1 site in Madison, Ind. In November 1982, Zimmer's construction was shut down; even though the \$1.7 billion plant is supposedly 97 percent complete, NRC officials have been quoted as saying the plant may be so seriously flawed that no amount of alteration could make it licensable.

"Zimmer is just a good case of exactly what's wrong with this industry," MacKenzie told SCIENCE NEWS. "And the key thing to remember," he added, "is that this industry is no stronger than its weakest utility. If 99 powerplants operate fine but one of them goes down the tubes and has another serious accident, then it's curtains for them all." It's a matter of public acceptance, he says. "The public will not tolerate a series of accidents that scare the wits out of people. If there is one — with a release of radioactivity, an evacuation, the whole business — [U.S. utilities] will certainly never construct another nuclear powerplant."

"To some degree he's correct," though less so than before the TMI-2 accident, Weinberg says. "TMI brought home to the utilities that they're all in the same boat," Weinberg says, adding that is why "all utilities now belong to an organization called the Institute for Nuclear Power Operations. Its job is to bring all the utilities up to appropriate standards." Walske adds that following a threat by NRC Chairman Nunzio Palladino that the industry could expect stricter regulation if the quality-assurance problem wasn't cleared up directly, INPO formed a task force specifically to address construction. "There are great incentives for managing construction right, but not everybody's done it right," Walske said. "However, I think we're now in a position to remedy that" — via INPO and the peer-group pressure its members can exert.

Though no one — even MacKenzie — is prepared to write off the nuclear industry yet, how well the industry recovers over the next decade may well depend, Weinberg believes, on whether public confidence is restored. □

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Satellites of Jupiter — David Morrison, Ed., with the assistance of Mildred Shapley Matthews. This book is based almost entirely on the Voyager discoveries of March and July 1979 and deals with the Jovian satellites both as individual worlds and as a system. U of Ariz Pr, 1982, 972 p., illus., \$49.50.

