Nuclear Power at 25

Bridging the credibility gap is a key to this youthful industry's survival

Duquesne Light

Engineers synchronize the first commercial nuclear power system at Shippingport on Dec. 18, 1957 (top). On Sept. 6, 1954, President Dwight D. Eisenhower signaled for a bulldozer to move the first earth for the Shippingport plant.

By JANET RALOFF

At 12:39 a.m., Dec. 18, 1957, Duquesne Light Co. engineers synchronized the turbine generator of a powerplant in Shippingport, Pa., with the utility's power-distribution network. And at that moment, commercial nuclear power was born. By 7 a.m. the Shippingport Atomic Power Station was feeding 12,000 kilowatts to homes and factories throughout the Pittsburgh area; two days before Christmas the reactor attained full power (68,000 kw). Small by today's standards, the experimental facility (operated jointly by Duquesne Light and the federal government) produced 7.3 billion kw-hours of power while testing a number of commercial-reactor concepts.

Though the Energy Department shut Shippingport down last October — two and a half months short of its quarter centenary — the industry that plant introduced lives on.

Remarking on the milestone, Institute for Energy Analysis Director Alvin Weinberg pointed out that "with the existing reactors and ones that are now under construction, something like 8 to 10 percent of all the world's prime energy will be produced by nuclear power in 1990. That can only be regarded as a fantastic achievement." However, Weinberg, the former director of Oak Ridge National Laboratory, added, "I don't think we'll be building a new reactor in this country for 10 years. So the industry, from that point of view, is certainly in the doldrums."

Less sanguine is James MacKenzie, senior staff scientist with the Union of Concerned Scientists in Washington. Characterizing the health of today's nuclear industry as "moribund," he says there is a serious "question of whether the industry will survive. There have been more than 100 reactors canceled since 1972; none have been ordered since 1978." Even Carl Walske, a self-proclaimed nuclear optimist and president of the Atomic Industrial Forum (a trade association), concedes 1982 was anything but a banner year: 14 reactors were delayed (had their construction schedules stretched out); 18 more representing 22,019 megawatts capacity — were canceled. Though there are still 59 plants under construction and another five on order, Walske believes as many as 10 of these may ultimately be canceled too. In MacKenzie's view, "That's a pretty sick industry."

Ironically, little more than a decade ago, the industry's growth was mushrooming, its prospects rosy. This was back in the era when nuclear advocates were predicting the day when engineering advances would render nuclear power so efficient that the electricity it generated would be "too cheap to meter." Even before the 1979 Three Mile Island-2 debacle, that slogan had become a favorite taunt by the industry's critics. In fact, nuclear power's costs had begun skyrocketing, fueled in part by lengthening construction schedules, falling growth in demand for electric power (relative to what utility planners had projected when ordering plants), a growing morass of regulatory changes (many requiring more paperwork and time-consuming reporting), and the need to retrofit costly and sophisticated safety-related changes into existing or previously designed plants.

At about the same time, flames of anti-nuclear activism were being fanned by a number of unresolved issues that included: how to safely manage high-level reactor wastes, how to ensure that plutonium recycled from wastes didn't end up in terrorists' bombs, and whether low-dose radiation exposures represented a demonstrable health hazard.

All this has hit electric utilities hard, especially in the recent recessionary economy. "I've said many times that the nuclear industry's top three problems are money, money and money," Walske quips; "after that comes regulation, public acceptance and waste disposal." Walske notes that in

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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Earthfire: The Eruption of Mount St. Helens — Charles Rosenfeld and Robert Cooke. The story of the eruption of Mt. St. Helens with spectacular photographs, many of which appear for the first time here. Goes on to profile the other mountains in the Cascade Range, explores the Pacific "Ring of Fire" and discusses plate tectonics, seafloor spreading, fissures and fault lines and geothermal flows. MIT Pr, 1982, 155 p., color/b&w illus., $25.

Fusion: Science, Politics, and the Invention of a New Energy Source — Joan Lisa Bromberg. A history of the magnetic fusion energy program that concentrates on the fusion work at four federally funded sites: Lawrence Livermore Laboratory, Los Alamos and Oak Ridge Laboratories and the Princeton Plasma Physics Lab. Covers the period from the program's inception in 1951 through September 1978. MIT Pr, 1982, 344 p., illus., $30.

Human Origins — Richard E. Leakey. One of the world's most famous paleoanthropologists presents here in simple language and with beautiful illustrations a summary of many of the important finds made in the field of paleoanthropology throughout the world. Describes how these finds have been made and how scientists use the finds to trace the development of the human race. Dutton, 1982, 87 p., color/b&w illus., $14.95.

The Language Lottery: Toward a Biology of Grammars — David Lightfoot. Pursues the question "what is the genetic, internally prescribed basis of language structure," in order to explain how children master their native language. MIT Pr, 1982, 224 p., $17.50.

Learning Disabilities Explained: The Lamm Institute's Guide to Diagnosis, Remediation, and Help for Your Learning-disabled Child — Stanley S. Lamm, Martin L. Fisch with Don McDonagh. Drs. Lamm and Fisch discuss their team approach — as practiced at the Lamm Institute for Developmental Disabilities. Explains what learning disabilities are, their causes and possible treatments, what kinds of tests are administered, as well as what parents can and cannot do to help. Appendices include a glossary of frequently used terms and listings of over 300 programs and organizations that can provide information and help on regional, state and national levels. Doubleday, 1982, 247 p., illus., $16.95.

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.