

THE INSIDE STORY



The industry's troubles mount

By David Moberg

If the partial meltdown of the Three Mile Island nuclear power plant near Harrisburg knocks out the nuclear industry in this country, it will only indirectly result from aggravated worries about nuclear dangers. The real threat is economic. The accident will intensify trends that already threaten to make nuclear power plants a bad investment.

Yet such developments would also serve as a powerful reminder that the decisions about nuclear power—and energy generally—are never purely economic, but always *politically* economic, as well they should be.

The nuclear industry has been tottering during the past several years. Orders for new nuclear plants have dropped precipitously since 1973: last year only two new ones were ordered and 19 previously announced plans were scrapped. More have been abandoned this year, including one in New York cancelled last week. The decline in orders threatens the future of the industry. Companies that build reactors have already considered dropping the business, and skilled engineers may go elsewhere.

Orders have declined partly because electricity demand has not grown as fast as the industry has projected over the past five years. With a "reserve margin" of 37 percent of capacity, when 20 percent is considered adequate, there is simply less need for new construction of generating plants. Moreover, since nuclear facilities provide about 12 percent of the nation's electricity (and less than 1 percent of its total energy budget), some observers suggest that even a shutdown of most nuclear plants could be accommodated if it weren't for the uneven geographical concentration of nuclear plants in a few states, such as Illinois, New York and South Carolina.

Even existing plants and those under construction have faced severe economic problems that are likely to grow worse. In 1972 the processed uranium ore called "yellowcake" sold for \$7-8 a pound on the spot market; today it is around \$44 a pound. Even long-term contract prices have risen to \$17.40 a pound and are expected to reach \$29 by 1985.

No longer such cheap fuel.

Relatively cheap fuel—cheap partly because of indirect government subsidy—has been the strong suit of the industry, and it is still the primary reason for the lower cost per kilowatt hour of electricity from nuclear plants (1.45 cents per kwh from all nuclear plants compared to 1.73 cents for a sample of the more modern coal-fired plants, according to Department of Energy figures for 1977).

However, the biggest problem is not the rising uranium costs and the severe limits on availability of fuel in the absence of breeder reactors; it is the capital cost of construction. Nuclear capital costs are high. The Department of Energy estimates that the capital costs per kwh of nuclear-generated electricity is 0.92 cents, or 60 percent of the total cost; for coal it is 0.62 cents, or 36 percent.

Therefore, it is very significant that from 1972 to 1977 the capital costs of building a new nuclear plant have increased 25 percent a year, nearly three times as fast as the general rate of inflation, according to Charles Komanoff, a leading nuclear industry economist who works for the Council on Economic Priorities.

Although the cost of coal-fired plants has also gone

up, the escalation for nuclear plants has been much faster—growing 2.5 times faster in the first half of this decade. Komanoff says that the average nuclear plant finished in 1979 would probably cost \$1,050 per kilowatt of capacity compared with \$675 per kilowatt of capacity for coal. Utility estimates are lower but they still show a jump of 50 percent in the capital cost between 1980 and 1985, making the price per kilowatt of capacity double what it was in 1977. It's worth remembering, in addition, that final costs have on the average more than doubled original estimates in recent years, according to Richard Pollock of *Critical Mass*.

The increasing costs stem from several sources, but directly or indirectly a large part of the rising expense is attributable to public pressure about safety and environmental dangers. John Crowley, manager of advanced engineering with United Engineers, calculated that the environmental and safety precautions mandated between 1967 and 1978 add \$141 million (in 1976 dollars) to the cost of a 1000 megawatt power plant completed in 1978. Such a plant might have cost in the vicinity of \$750 million.

The safety worries not only add costs by requiring more and better protective systems but also by extending the time between licensing and completion—which has jumped from five to six years in the early days of the industry to ten to 12 years recently. Each month's delay costs from \$9 to \$11 million, according to a Congressional Budget Office study. The high interest payments that utilities must make in these inflationary times simply exacerbates their difficulties, partly because they face growing opposition to rising utility rates and because in most states they cannot include costs of construction-work-in-progress in their rate base.

A "mature" industry?

In an attempt to cut those costs, the industry has pushed for speedier licensing and lessened public participation, which the Carter administration continues to support. Essentially, Carter and Energy Secretary James Schlesinger back the industry view that nuclear power is now a "mature" industry with a "learning curve" that is tapering off, permitting greater standardization of regulations and procedures.

Even before the Three Mile Island accident, that argument was dealt a serious blow last January when the Nuclear Regulatory Commission repudiated the results of its *Reactor Safety Study* (the Rasmussen report) that had attempted to define clearly the probability of dangerous accidents. Consequently, "the chances of a potentially catastrophic reactor accident must once more be regarded as 'uncertain,'" according to the February Congressional Budget Office study.

The Three Mile Island accident confirmed that uncertainty with a vengeance, since several of the most serious problems at Three Mile Island were not taken into account in the Rasmussen report, including the emergence of the potentially explosive hydrogen bubble, the destruction by radiation of crucial monitoring devices and the lately developed problem with a slowed flow of water through the partially melted reactor.

"This will take some serious thinking," nuclear engineer Crowley said. "After all the piles of paper, something happened we hadn't planned on."

Problems with maintenance and safety over the years have contributed to another major economic problem: the reliability of reactors. Instead of functioning at their predicted 80 percent of capacity, nuclear reactors were functioning from 1973 to 1976 at roughly 55 percent of capacity. In the last two years that figure has improved. However, the added capital costs of nuclear reactors mean that the overhead and interest costs of producing electricity jump markedly when the capacity declines.

What impact will the Three Mile Island accident have

on these costs? It is safe to assume that regulatory delays will increase, not decrease. "No plant without a construction permit will be built henceforth," Komanoff boldly predicts, adding that plants with permits but not started and even plants under construction may be stopped. There will undoubtedly be additional safety requirements, perhaps some retrofitted—at great cost in construction and idle reactor time—on existing facilities.

Other anticipated costs include reworking of designs, greatly increased quality assurance at all stages of production, higher costs for labor and materials for new equipment and greater NRC supervision. The greater public caution could also lead to more frequent shut-downs, since "the sequences that led up to this accident occur every month in this country, although this is the only time it progressed to a meltdown," according to Marc Messing of the Environmental Policy Center. All that will result in lowered capacity utilization and higher costs.

Also, there will be growing pressure to include an analysis of nuclear proposals in waste disposal and "decommissioning" (dismantling an exhausted plant after its 30-year expected lifetime). Waste disposal is still unsettled and no plant has ever been decommissioned. (That could cost as much as construction.) Consequently, Messing says, "my gut feeling is that the cost of nuclear power plants should be two to three times what it is today."

Immediately after the accident, nuclear stocks dropped sharply and many investors had already grown chary of the nuclear industry. There will undoubtedly be an all-out publicity effort to convince Americans that we need nuclear power, even though a complete shutdown of nuclear plants now would mean only a slight (Komanoff says 5 percent) increase in oil imports and electricity prices in the worst case and might even be accommodated by conservation, coal, better utilization of the national utility grid and various renewable energy alternatives.

Anti-nuke forces powerful.

If the nuclear industry is brought to its knees by economic woes, however, it is because the environmental, safety and outright anti-nuclear movements have politically forced a much different economic calculation that takes into account our biological and social environment, considered as "externalities" by the industry.

Meanwhile, General Public Utilities, which owns Three Mile Island, has some specific woes: \$600,000 extra per day to buy electricity elsewhere, a potential loss of nearly \$1 billion if the plant cannot be reopened (which seems likely), possibly several hundred million dollars to clean up and then dealing with a spate of lawsuits.

Pennsylvania state Rep. Harold Brown, whose district is near Harrisburg, is now fighting to prevent General Public Utilities from passing on the costs of its fiasco to the public and to guarantee that residents of a county can vote on whether a nuclear plant could be built there.

"The stockholders are making the profit," he argues. "They should pay for their mistake in investment. Life is too complicated to have decisions like these made by a couple hundred politicians, even. People understand that the experts don't really know what they're talking about, but the companies and the legislature don't really want to turn decision-making power over to the people. A radical taste of pure democracy is needed now."

Such a pure democracy would probably bring the end to nuclear power, but even a partial democracy has so raised the cost that even capitalists will have to reconsider their love affair with "the peaceful atom." ■

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IN THE NATION

THE BIG LEAK

The China Syndrome Sequel

By Joanna Foley

PHILADELPHIA

IN MOVIE THEATERS NEAR HARRISBURG, Pa., *The China Syndrome* was playing. Meanwhile, a real life version of the scenario began 16 miles to the southeast at Three Mile Island. As the nation's worst nuclear accident unfolded with radiation spread over 2000 square miles and a meltdown threatened in the reactor's core, life seemed to first halt, then surpass, art at Unit Two on the Susquehanna River. The movie's viewers could at least relax after two hours when the threatened meltdown was narrowly averted. But anxious observers all across the country had to wait almost a week to be certain that the real finale wouldn't feature an explosion, a meltdown or an evacuation.

Wednesday: At 4:00 a.m., a neighboring farmer in the village of Goldsboro heard a loud noise and saw a geyser of steam over the plant. Inside, equipment failures were taking place while the plant operated at 97 percent of capacity. First, filters clogged in the primary cooling system around the reactor, causing two pumps to fail. The cooling system built up water pressure and blew open a safety valve in the pressurizer, which then stuck open.

This allowed radioactive cooling water to escape from the primary cooling system and flow onto the floor of the reactor's container. Without the cooling water, the exposed fuel rods overheated, releasing radioactive gases. The backup cooling system began replacing the leaking coolant, then apparently was turned off by operator error before being turned on again. Then 15,000 gallons of radioactive water were pumped from the reactor to the auxiliary building where the vent system had no radiation filters. The water vaporized and was released over the surrounding farmlands and suburban homes, contaminated with radioactive iodine, krypton and xenon.

Three hours later state officials learned about the accident from Metropolitan Edison, the plant's manager and part owner. The company said it had waited to find out if radiation had escaped. When the release was verified, a general emergency was declared.

Many criticized the delay. One observer wondered if there was an intention to conceal the accident. Just as in the movie. Kay Pickering, a member of Three Mile Island Alert, a nuclear watchdog group, says that other residents have reported loud noises and steam geysers since the plant's Unit One began operating in 1974. "Maybe they waited so long to report it because accidents had occurred before and the plant had been able to turn the situation around," she said.

At 11:00 a.m. Met Ed intentionally vented more steam over the area. "The officials faced a difficult choice of venting radioactive gas into the environment or risking a pressure buildup that might burst the containment walls around the reactor," said Dr. Judith Johnson of the statewide Environmental Coalition on Nuclear Power.

"Even though the containment walls are concrete four feet thick, the company knew that Unit One's containment had voids in the concrete big enough for a man to sit in. The company probably feared that this containment wasn't solid enough to withstand the pressure."

Whatever the utility officials' fears, their first statements to the media were reassuring. "The plant is cooling down

Unlike the movie, the real life drama took a week to unfold. And the effect on hundreds of thousands of local residents, and on the industry, will last a lot longer.

Pennsylvania Civil Defense deputy director Craig Williamson looks over possible evacuation plans.

in an orderly fashion, with no consequences to the public," said one spokesperson. Another declared, "We're not in a China Syndrome situation."

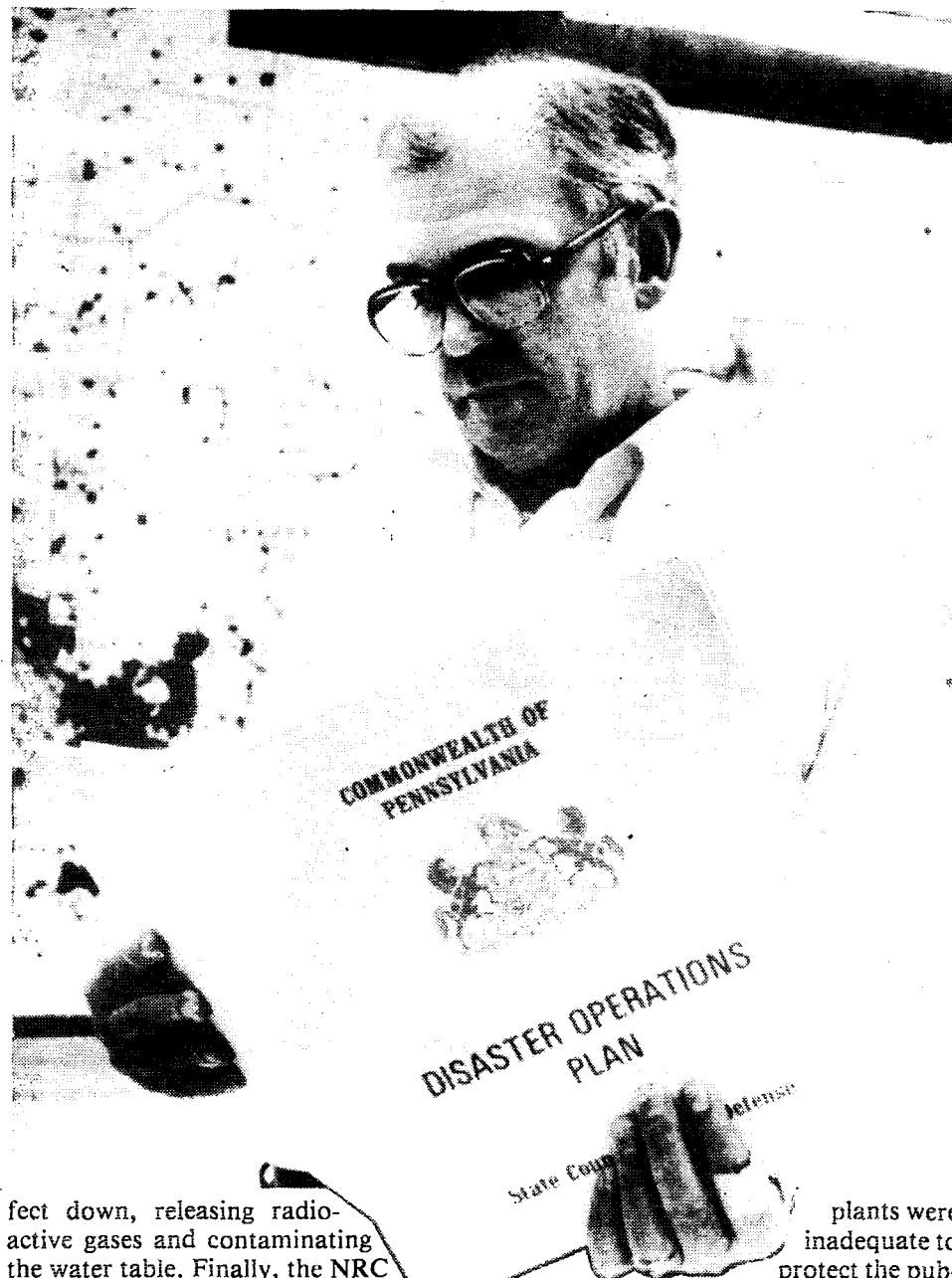
Government officials at first were scarcely equipped to dispute those assessments. Pennsylvania had no equipment to check plant radiation; the Nuclear Regulatory Commission maintains no monitoring instruments at this site or any other plant. Soon, however, NRC made its own measurements and reported that radiation levels outside were up to 3 millirems an hour, compared to the normal .01 and that direct radiation was beaming through the walls of the reactor containment as well as being released in steam.

By early afternoon I boarded the New York Metroliner for Pennsylvania, planning to stop briefly in Philadelphia for the first demonstration held in response to the accident. There I listened as the Keystone Alliance accurately previewed the next two day's events. Keystoneers warned that rising levels of radiation might be dangerous and that the reactor wasn't yet under control. Reluctantly, I decided not to go to Three Mile Island.

Thursday: The severity of the accident became increasingly clear when NRC chief Dr. Joseph Hendrie admitted that the reactor core was damaged and added, "The radiation we see is not a level I would take casually." Radioactive steam emissions continued at the plant. Higher than normal levels of radioactivity were detected 20 miles away. Prominent nuclear critics were concerned about the radiation levels. At a Harrisburg press conference, Dr. Ernest Sternglass, a University of Pittsburgh radiology professor, called for the evacuation of pregnant women and preschool children from an area within a three-mile radius of the plant. Dr. George Wald, a Nobel laureate in medicine, joined Sternglass in disputing the prevailing view that radiation is harmless below a certain threshold. They said it increases the long-term risks of cancer.

Although 500 people worked at the nuclear plant, the possible health problems of workers went largely unreported. Fifteen were contaminated with radiation, four severely, out of an estimated 60 on duty when the accident occurred. Others would be contaminated later. Soon nuclear supporters began claiming that nuclear plants had never killed anyone, ignoring deaths and injuries to workers in accidents from Oregon and Washington to Michigan.

Friday: It was a China Syndrome kind of day. In nuke industry slang, a China syndrome is the dangerous situation where an overheated reactor melts through the floor, into the earth and, theoretically, all the way to China. Actually, scientists think a melted core should stop about 50



feet down, releasing radioactive gases and contaminating the water table. Finally, the NRC admitted publicly what activists had been saying privately for two days—the Three Mile Island accident could still result in a meltdown. The core was still hot and uncontrolled. Complicating the problem were the bubbles of gases collecting in the reactor and its containment. If the bubbles blocked the cooling water from the core, they would cause overheating and a possible meltdown.

This danger plus the heaviest yet emission of radioactive steam seemed to call for both action and reassurance from government officials. Governor Thornburgh closed schools within a five-mile radius, urged pregnant women and preschool children to leave and asked residents within a ten-mile radius to stay indoors. As for reassurance, Lt. Gov. Scranton announced that he had toured the site and felt fine after receiving 80 millirems in two hours. President Carter dispatched NRC regulator Harold Denton as his personal representative to manage the crisis.

The press and even government officials complained that they found it hard to sort through contradictory explanations to figure out what was really happening. But then Met Ed's press relations reached a new level of candor when reporters questioned the dumping of 400,000 gallons of contaminated water into the Susquehanna. "I don't know why we need to tell you each and every thing we do," snapped vice president John Herbein.

Saturday: When the gas bubbles were found to be potentially explosive hydrogen and oxygen, evacuation of 600,000 people became a serious possibility. Officials discovered that Pennsylvania's evacuation plan was not one of the ten that met federal standards. Coincidentally, the government accounting office released a new report that said the evacuation plans for areas adjacent to nuclear

plants were inadequate to protect the public. Many residents left on their own. A total of 200,000 would eventually depart.

The future of nuclear energy was heatedly debated in the media with a few industry officials and optimists detecting a silver lining behind the steam cloud hanging over Three Mile Island. Dr. Vince Sailor, a Brookhaven lab physicist, said, "The system designed to protect the public works quite well."

Sunday: While most people left, others were just arriving. President Carter arrived for a 25-minute visit, accompanied by Mrs. Carter but not Amy. His carefully chosen words suggested that he was still committed to a role for nuclear power in his energy plans. Also arriving to study the problems were 1000 technicians and consultants from other power plants, universities and foreign countries.

The hydrogen bubble problem was such a new wrinkle, according to Dr. Denton, that it had never been anticipated by plant designers or nuclear experts. As plant officials worked to reduce it, they couldn't be certain they were succeeding because it was difficult to measure. Gradually, the bubble shrank, reduced by the use of hydrogen recombiners which turned the gas back into water.

Monday: A day for mostly good news: the bubble was significantly smaller and evacuation less likely; a state health official said that a person who stayed within ten miles of the plant had only received 9 millirems over the normal exposure; radioactive iodine was found in only minute amounts in a few samples of milk. The bad news was that radiation levels inside the reactor reached 30,000 rems, 3000 times above normal, knocking out one instrument and threatening others.

Continued on page 8.