Three Mile Island: A 20th Anniversary Remembrance

By ACSH Staff — March 1, 1999

Overview

Twenty years ago, on March 28, 1979, an accident at Three Mile Island Nuclear Station, in Pennsylvania, resulted in overheating of the core of one of a pair of nuclear reactors and set the stage for a minor leak of radiation into the atmosphere. The radiation that leaked, per se, has had no proven effect on anyone's health. But the American public's knowledge of the partial meltdown and the leak, ignited by the media's sensationalizing of these events, had considerable health and other effects—notably widespread stress, a marked increase in unfounded apprehension toward nuclear power, and an increase in the public's distrust of the nuclear industry.

On the 20th anniversary of the accident, the American Council on Science and Health (ACSH) recalls the non-nuclear chain reaction that frightened the public, contributed to the stunting of the nuclear industry, and became synonymous with "Three Mile Island."

The Accidents

The failure sequence at Three Mile Island Nuclear Station, a commercial nuclear power plant ten miles south of Harrisburg, Pennsylvania, began with a glitch in the cooling system at about 4:00 A.M. on March 28, 1979. In response to the problem, operators turned off a pump designed to cool the core of the nuclear reactor in Unit 2, believing the nuclear reactor contained too much water. A backup pump switched on, but because valves that had been altered during testing of the backup system had not been realigned, the backup system failed. The nuclear reactor and turbine shut down according to design, but heat from radioactive decay kept the temperature of the reactor core high. To cool the core, a valve atop a pressurizer opened, and hot water consequently moved from the primary cooling system into a drain tank.

Then came a major problem: The aforementioned valve (a "pressure relief valve") became stuck open, but because of instrument shortcomings, plant operators did not know the valve was open. Consequently, too much water escaped through it. When the drain tank filled, one of its components (called a "rupture disc") broke, and thousands of gallons of radioactive water spilled into the basement of the containment building (a structure designed to prevent the accidental release of radioactive materials). Water loss from the core left it partially uncovered, and thus the core began to self-destruct. This increased the contamination in the water that was pouring into the basement. Pumps automatically began removing the contaminated water to waste-storage tanks in an auxiliary building, but it overflowed the tanks and spilled to the floor. Since the temperature of the water was high, the gases dissolved in it escaped. These gases, carrying approximately 2.5-10 million curies (units of radioactivity), moved through a stack into the atmosphere and began to increase radiation dose rates outside the facility.
State and federal officials began getting calls from employees at about 7:00 A.M. There had been an accident at the facility, the callers explained, and emergency procedures were in effect. By evening plant engineers had coolant water protecting the core, and the crisis was deemed fundamentally over. Concern was expressed, however, that the hydrogen the partial meltdown had generated might set off an explosion that could breach the reactor encasement and, theoretically, the concrete building housing the core. (Experts subsequently said that the risk of a such an explosion was nonexistent.)

By that night virtually everyone in the United States learned that something risky was unfolding at Three Mile Island (TMI). The riveting question was, how risky?

**Exaggeration**

"Good evening," said longtime CBS Evening News anchor Walter Cronkite on the day of the partial meltdown. "It was the first step in a nuclear nightmare; as far as we know at this hour, no worse than that. But a government official said that a breakdown in an atomic-power plant in Pennsylvania today is probably the worst nuclear accident to date. There was no apparent serious contamination of workers. But a nuclear safety group said that radiation inside the plant is at eight times the deadly level; so strong that after passing through a three-foot-thick concrete wall, it can be measured a mile away."

In the days that followed, the public's fear mounted as activists and the media fueled it with references to the political thriller The China Syndrome, a fictional film released that month about a possible meltdown. On March 30 Mr. Cronkite said on his nightly broadcast: "We are faced with the remote but very real possibility of a nuclear meltdown at the Three Mile Island atomic-power plant. The danger faced by man for tampering with natural forces, a theme familiar from the myths of Prometheus to the story of Franken-stein, moved closer to fact from fancy through the day." The New York Times warned of a "Credibility Meltdown" and compared the safety claims of TMI officials and the "safety claims" of fictitious characters in The China Syndrome. The paper added, unconvincingly, that it was not implying "any larger parallel."

Nobel laureate George Wald and other antinuclear activists flew to Harrisburg for the paradoxical purpose of encouraging everyone else to leave. On March 30—in response to a remark from the chair of the U.S. Nuclear Regulatory Commission (NRC)—the governor of Pennsylvania recommended that all pregnant women and preschoolers living within five miles of the facility evacuate. Sixty percent of those who lived within that radius, and about 39 percent of those who lived within 15 miles of the facility, did so. But the day of median "evacuee" returns, April 2, preceded that of the governor's rescindment of his recommendation. Local schools reopened on April 11.

**Studies**

By nearly all scientific accounts, the series of accidents at the TMI facility did not warrant the mass provocations that made "Three Mile Island" synonymous with "nuclear menace." Shortly afterwards researchers began trying to determine whether the community directly affected by TMI events had developed health problems because of those events. Many such studies have been performed, and the only TMI-related health problems found have been psychologic. Initial studies
included one conducted by an ad hoc group comprising agents of the NRC, the U.S.
Environmental Protection Agency (EPA), and the U.S. Department of Health, Education, and
Welfare (HEW). The time frame on which their report focused was the period March 28 to April 7,
1979. The report, published the following month, stated that:

- the collective dose associated with material released during the aforementioned period
  represents a "minimal" possibility of extra risks to the population outside the facility;
- the projected number of extra terminal-cancer incidents due to the TMI radiation leak over
  the lifetimes of persons living within 50 miles of the facility is "approximately one"; and
- the projected number of all extra instances of illness (fatal and nonfatal) in that population
  due to the leak is "approximately two."

In October 1979 the President's Commission on the Accident at Three Mile Island chaired by
Dartmouth College president John G. Kemeny and nicknamed the "Kemeny commission" reported
that, for persons living within 50 miles of the facility, the extra radiation dose due to the TMI leak
amounted to about one percent of the amount absorbed each year from all other sources (virtually
all of which are natural); and that, for persons living within 5 miles of the facility, the extra radiation
dose amounted to about 10 percent of the quantity absorbed annually from all other sources. The
Kemeny report further stated: "On the basis of present scientific understanding, the radiation
doses received by the general population as a result of radiation exposure released during the
accident were so small, that there will be no detectable additional cases of cancer, developmental
abnormalities or genetic ill health as a consequence of the accident at TMI."

The Kemeny commission did not, however, come up empty-handed regarding health effects.
According to its report, "The major health effect of the accident appears to have been on the
mental health of the people living in the region of Three Mile Island and of the workers at TMI.
There was immediate, short-term mental health distress produced by the accident among certain
groups of the general population living within 20 miles of TMI."

Released in February of the following year, a report from the Pennsylvania governor's TMI
commission stated that:

- available information provided no reason to dispute the Kemeny commission's findings;
- most of the radiation had been contained;
- "the actual release will have a negligible effect on the physical health of individuals"; and
- perhaps the biggest health effect the accident had had was its adverse influence on the
  mental health of TMI-vicinity residents.

The latter report cited findings of the Behavioral Effects Task Force of:

- a transient but "pronounced demoralizing effect" on TMI-vicinity residents in general;
- continued demoralization of Three Mile Island Nuclear Station employees; and
- "continuing problems of trust" among both groups "that stem directly from the accident."

The stress among residents apparently stemmed partly from disagreements within families over
whether the situation warranted leaving the area. According to an NRC-sponsored telephone
survey that the Pennsylvania governor's commission cited, nearly 20 percent of the households
interviewed had conveyed such discord. In a study published in 1981, G. A. Tokuhata and E. Digon concluded that there had not been any post-accident excess fetal and infant deaths in the TMI area. In a study published a few years later, the researchers found "no evidence of excess cancer deaths in the five years after the TMI accident." "On the contrary," they stated, "residents in the area within 20 miles of the plant had fewer cancer deaths [emphasis in original] than expected during the five-year period. The cancer death rates in the individual communities, in particular those downwind from TMI, showed no unexpected cancer patterns."

Later studies have confirmed findings from early studies on the possible health effects of the TMI accidents. For example, in a Columbia University Division of Epidemiology study on cancer incidence published in 1990, researchers found that no excess occurrences of cancer had resulted from the TMI radiation leak. In September of the same year, the National Cancer Institute (NCI) released a report of research it had conducted on populations near nuclear power plants. The NCI had concluded that those populations (including the one near TMI) had no excess cancer risk. "Further," the report stated, "measurements of radioactive releases from nuclear facilities indicate that the release from routine operations is much below natural background radiation . . . ."

In June 1996 Judge Sylvia Rambo of the United States District Court of Pennsylvania dismissed 2,100 lawsuits based on claims of health problems due to the radiation leak at TMI. She stated:

The parties to the instant action have had nearly two decades to muster evidence in support of their respective cases. . . . The paucity of proof alleged in support of Plaintiff's case is manifest. The court has searched the record for any and all evidence which construed in a light most favorable to Plaintiffs creates a genuine issue of material fact warranting submission of their claims to a jury. This effort has been in vain.

(The cases are pending before the Third U.S. Circuit Court of Appeals.)

*Long-Term Effects*

The radiation that leaked from Three Mile Island Nuclear Station evidently has not had a discernible physical effect on anyone. But the American public's knowledge of the partial meltdown and the leak, ignited by the media's sensationalizing of these accidents, has contributed to the crippling of the nuclear industry in the U.S. In the last 20 years, no company or public utility in the U.S. has ordered a nuclear reactor. The operating permits for half of the more than 100 nuclear reactors in the U.S. are scheduled to expire by 2015, but none has been renewed—though nuclear power provides 20 percent of the electricity this country uses. (In some European countries, nuclear power provides twice to four times that percentage.)

The public fears nuclear power disproportionately to risk assessments published in peer-reviewed journals. In September 1994 The Los Angeles Times conveyed the findings of a University of Oregon study in which members of various American populations had been asked to rank various technologies, pursuits, and habits according to how risky they thought they were. Respondents among college students and respondents among members of the League of Women Voters had ranked nuclear energy production as the top hazard—riskier, for example, than habitual cigarette smoking or working as a police officer. In contrast, respondents who were scientists had given
nuclear energy production the 20th rank and had ranked bicycling, swimming, and undergoing an x-ray exam as more hazardous. In 1971, eight years before the partial meltdown at TMI, 58 percent of Americans polled in a survey cited in the newspaper article had said they would be agreeable to having a nuclear power plant in their respective communities. According to a later survey, however, after the partial meltdown only 28 percent said they would be agreeable to such—and 63 percent said they’d be averse to having a nuclear power plant around. In a 1989 issue of The New Republic, the late British journalist Henry Fairlie stated:  

At Three Mile Island, the fail-safe system worked. The power station switched itself off. There was a scare, but no disaster. Yet ... nuclear power in America, as in no other nation, has been paralyzed.

The media is partly, if not largely, to blame for the public's inordinate distrust of nuclear power plants. A governmental task force examined media treatment of the critical events at TMI shortly after their occurrence and found, according to The Los Angeles Times, that reporters covering those events "knew shockingly little about nuclear power and compounded their ignorance by focusing too narrowly on worst-case scenario questions." In a 1993 survey of scientists, the Center for Media and Public Affairs found that 61 percent believed the media was overstating the risks of nuclear power plants.

But widespread hyperbole about the risks of such facilities has not only undermined an industry that most experts say produces clean, safe, and relatively inexpensive power—it also distracts the public's attention from more mundane hazards that are both more significant and personally controllable: cigarette smoking, cycling without wearing a helmet, driving with one's seat belt unfastened, and sunbathing, for example.

The radiation leak at TMI is the worst nuclear-power event that has ever occurred in the U.S. If the failure sequence at TMI was disastrous, it was so largely indirectly: Mechanical and human errors had led to the melting of more than one third of the core of a nuclear reactor; TMI- vicinity residents were stressed out; and governmental and economic responses to the partial meltdown and to the public's apprehension, plus media sensationalism, have made the opening of new plants forbiddingly difficult. On the other hand, much has been learned from the events at TMI; this knowledge has been applied to nuclear reactors worldwide; and most of the newer nuclear reactors consequently have fewer components and are safer. Often neglected are that the safety systems at the TMI facility performed well and that the radiation leak was relatively small.

The nuclear reactor in Unit 2 at TMI has been in monitored storage since it shut down—despite having undergone a cleanup that cost about $973 million. Operation of the reactor in Unit 1 resumed in 1985 and has since been continuous. In 1989 the latter reactor was given an efficiency rating of 100 percent. It is the most efficient nuclear reactor in the U.S.

Numerous studies have led to the downplaying or outright dismissal of allegations of health effects of the TMI radiation leak. The "nuclear nightmare" of which Mr. Cronkite spoke became actual only in the sense that knowledge of the leak was very distressing.
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