A Look Back at Three Mile Island

How Misinformation and Confusion Branded the Nuclear Power Industry

BY ED RUTKOWSKI

Thirty years ago, an accident at the Three Mile Island (TMI) nuclear power plant in Dauphin County, Pa., focused the world's attention on the risks of nuclear energy. For the better part of a week, TMI dominated the major print and broadcast media, as engineers worked to rescue the crippled plant, industry experts publicly disagreed about the consequences of the accident, and journalists attempted to sort through the confusion. Even Hollywood played a small role: in a bizarre irony, a major motion picture about an accident at a nuclear plant—*The China Syndrome*, starring Jane Fonda and Michael Douglas—had opened just two weeks before real-life events gave new urgency to the term "meltdown."

For better or worse, the TMI incident had substantial and lasting effects on the nuclear power industry in the United States. Prior to TMI, the political battle between proponents and opponents of nuclear power had been fought more or less to a standstill, with public opinion polls showing general, though guarded, support for the industry. After TMI, however, public opinion turned decidedly against nuclear power (Walker 2004).

And yet, no one died as a result of TMI, and data have shown no increase in the local cancer rate (Walker 2004). The accident, while serious, was nowhere near as dangerous as the 1986 Chernobyl disaster in the former Soviet Union. In fact, by forcing the closure of local factories for a short while, TMI might even have contributed to public health (Sandman 2004).

How has an event in which no one was killed become synonymous with catastrophe? The answer lies in the way that authorities dispersed—and, in some cases, withheld—information. When all was said and done, TMI had little effect on health. But from a communications standpoint, TMI was a genuine disaster.

Error and Malfunction

The incident began at 4 a.m. on Wednesday, March 28, 1979, when a series of feedwater pumps at TMI's Unit 2 reactor stopped working. As a result, the temperature of the coolant carrying heat from the reactor core rose, and the pressure inside the cooling system increased. Steam and water were vented through an emergency valve known as a pilot-operated relief valve (PORV). Soon afterwards, the reactor "scrammed," automatically halting its process of nuclear fission.

After the pressure returned to normal, the PORV should have closed, but it did not. For the next two-plus hours, the Unit 2 reactor lost more than 30,000 gallons of coolant through the PORV.

Why didn't the operators in the Unit 2 control room recognize that the PORV was stuck open? Instrumentation certainly contributed to the error. Operators believed the PORV was shut because an indicator showed that a signal had been sent to close the valve. However, none of the instruments showed the valve's actual position. A cacophony of alarms added to the confusion (Walker 2004).

"Part of the problem with the control room design was the giant panels of lights," explains Carol Berger, who was a member of the Health, Physics and Dosimetry task group for the President's Commission on the Accident at Three Mile Island. "They could be red, yellow or green. A red light could mean a normal operating condition. It was very difficult to look up and figure out quickly if something was going wrong."

The operators' training also proved counterproductive. Their preparation had emphasized the need to avoid putting too much coolant into the system. Instruments showed both a rising water level and a drop in pressure; confused by these apparently contradictory readings, the operators acted according to their training. When the plant's emergency coolant pumps turned on, responding to the loss of coolant through the PORV, the operators shut them down (Walker 2004).

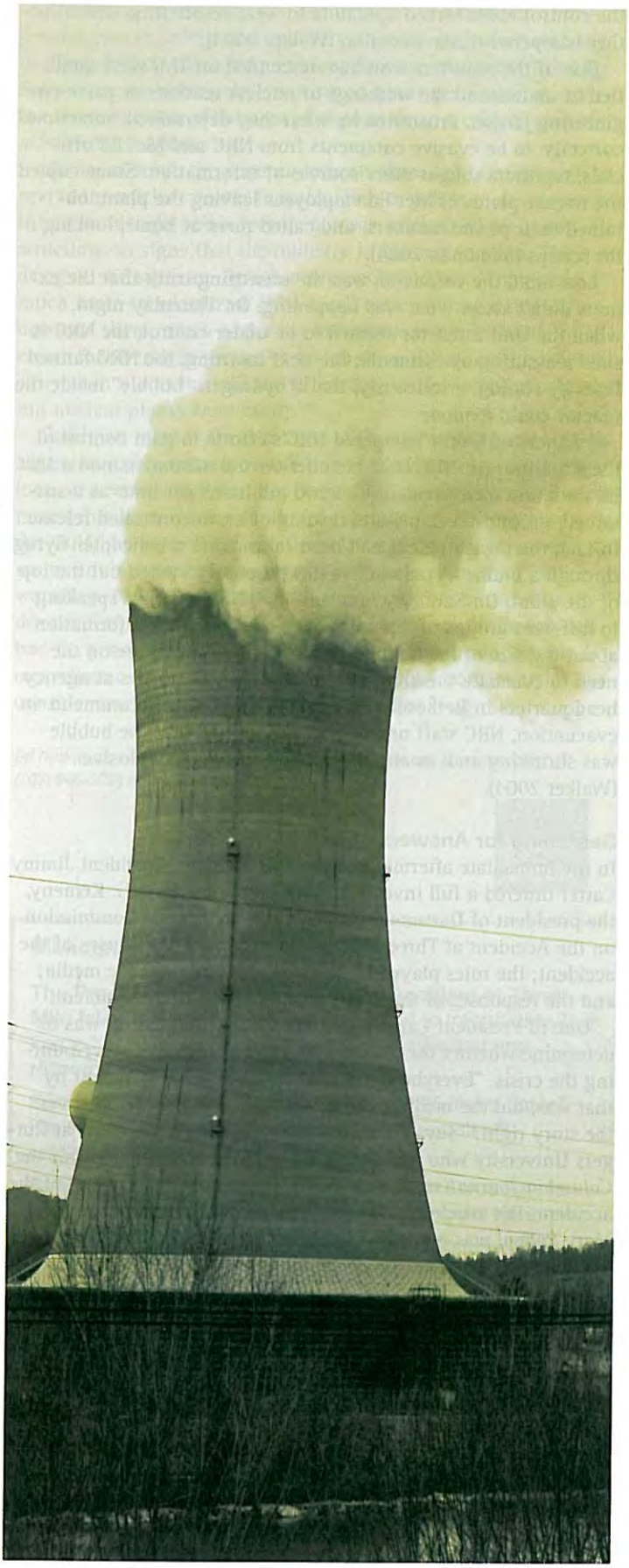
"Everybody says this jokingly," Berger says, "but it truly is the case—if the [operators] had just gotten up and gone out to breakfast that morning, the story wouldn't have made the local news that evening."

Sometime after 5 a.m., steam in the coolant caused the primary pumps to start vibrating. Worried that the vibrations would rupture the pipes, and still confused by readings showing a high water level, the operators turned the pumps off. With neither the primary nor the emergency pumps operating, coolant was no longer being forced through the reactor. More coolant boiled away, and the core became partially uncovered.

As the heat in the core rose, the cladding surrounding the uranium fuel broke down, releasing radioactive material into the coolant. At one point during the crisis, radiation in the building that housed the reactor measured 6,000 rads per hour, more than six times the lethal dose. None of the measurements of off-site radiation were anyhere near as high, about 1 millirem per hour. But sustained readings at this level would reach the annual regulatory limit for large populations in just one week (Walker 2004).

Voices of Confusion

When they arrived on site, staff from the Nuclear Regulatory Commission (NRC) and Metropolitan Edison (Met Ed), the company that operated TMI, found the control room at Unit 2 in near chaos. A lack of dedicated telephone lines meant that the flow of information into and out of the control room was halting at best. There were no speaker phones; when calls did get through, the operators gathered around the phone and propped the receiver on a chair. Radioactive gas leaking into



the control room forced operators to wear respirators, which further hampered communication (Walker 2004).

Few of the reporters who had descended on TMI were qualified to understand the workings of nuclear reactors or parse engineering jargon. Frustrated by what they determined, sometimes correctly, to be evasive comments from NRC and Met Ed officials, reporters sought other sources of information. Some copied the license plates of Met Ed employees leaving the plant, obtained their phone numbers, and called them at home, looking for scoops (Sandman 2004).

Lost amid the confusion was the unsettling truth that the experts didn't know what was happening. On Thursday night, when the Unit 2 reactor seemed to be under control, the NRC issued reassuring assessments; the next morning, the NRC fanned fears by stating, erroneously, that a hydrogen "bubble" inside the reactor could explode.

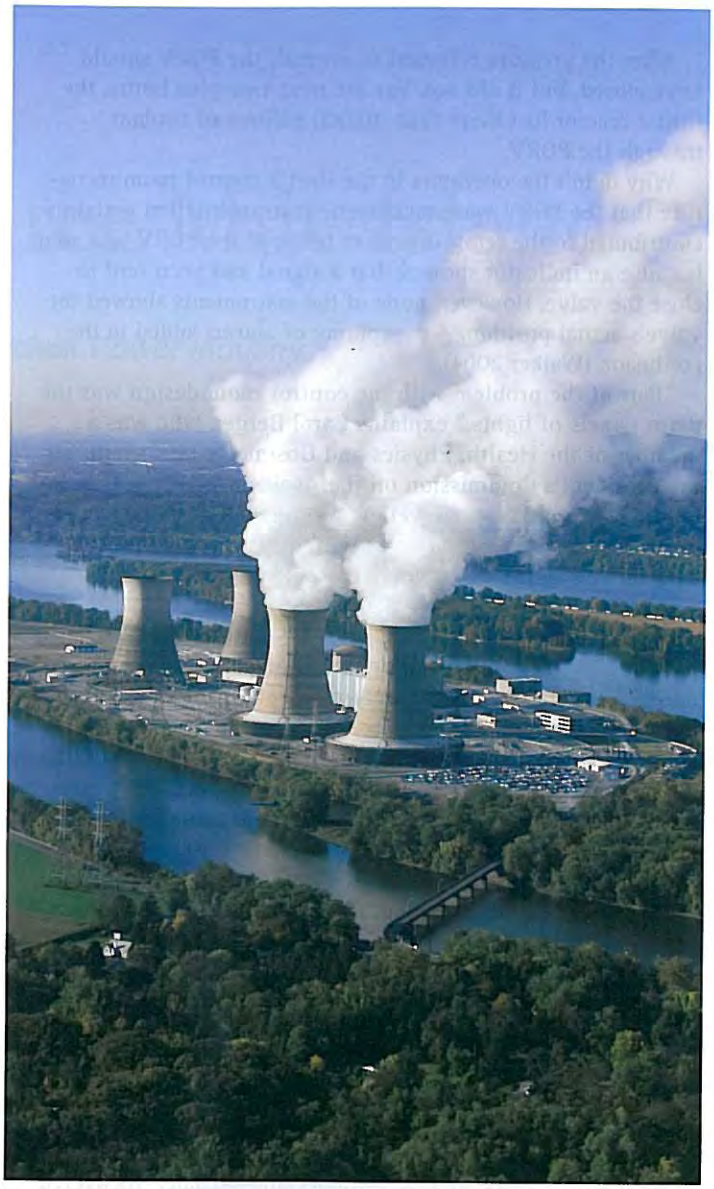
Further confusion hampered NRC's efforts to gain control of the situation. An NRC staff member on site misunderstood a Met Ed radiation measurement of 1,200 millirems per hour as a sustained, ground-level, off-site reading of an uncontrolled release. In fact, the measurement had been taken from a helicopter flying through a plume of radioactive gas purposely vented out the top of the plant. On Saturday morning, two NRC officials speaking to different groups of reporters gave contradictory information about the size of the bubble. The NRC could not agree on the need to evacuate the area; by the time commissioners at agency headquarters in Bethesda, Md., finally decided to recommend an evacuation, NRC staff on site had determined that the bubble was shrinking and, in any case, had never been explosive (Walker 2004).

Searching for Answers

In the immediate aftermath of the TMI incident, President Jimmy Carter ordered a full investigation. Chaired by John G. Kemeny, the president of Dartmouth College, the President's Commission on the Accident at Three Mile Island examined the causes of the accident; the roles played by the NRC, Met Ed, and the media; and the responses of the utility and all levels of government.

One of President Carter's charges to the commission was to determine whether the public's "right to know" was served during the crisis. "Everybody figures what he probably meant by that was, did the media lie or exaggerate, did the media cover the story right?" says Peter M. Sandman, then a professor at Rutgers University who had been sent to TMI on assignment for the *Columbia Journalism Review* (CJR) to "cover the coverage" of the accident. His article "At Three Mile Island," coauthored with Mary Paden, was published in the July/August 1979 issue of CJR and came to the attention of the Kemeny commission.

The commission invited Sandman to serve on a task force that would examine communications during the TMI crisis. He accepted, on one condition: that the sources for the media's stories on TMI would be scrutinized as much as the media itself. The commission agreed, and Sandman went to work, helping the task force piece together a chronology of information exchanges. Their final report described the flow of information about TMI before and during the crisis, with detailed narratives of five key events. As a result of the report, the Kemeny commission faulted Met Ed for being slow to release bad news, criticized both Met Ed and the NRC for failing to provide enough staff to brief the press on technical matters, and blamed both the media's lack of expertise and the confusion of their sources for flawed coverage of the incident (NRC 2004).



Contrary to popular perceptions of the media as alarmist, the commission found that most contemporary accounts of the dangers posed by TMI were reassuring. In an article occasioned by the accident's 25th anniversary, Sandman, who is now a risk communication speaker and consultant, addressed the media's tendency to play against type in a crisis. "In ordinary times, journalists tend to make the news as dramatic as they can; their sensationalist bias is built-in," he wrote. "But not in a crisis–that's when journalists ally with their sources in a misguided effort to keep people calm by over-reassuring them" (Sandman 2004).

It's worth pointing out, Sandman notes, that few people were reassured by the media's coverage. "Many were alarmed by the supposedly reassuring coverage precisely because they sensed that they weren't getting the unvarnished truth," he says. "A

content analysis will always code 'there's nothing to worry about' as a reassuring statement, but people are not reassured by that kind of glib over-reassurance; they find it terrifying. That's a key lesson for communicators who are sourcing or covering industrial accidents, terrorist attacks, natural disasters, infectious disease outbreaks, etc."

Another commission finding prefigured what would become a principle of the as-yet nonexistent field of risk communication. On the third day of the crisis, representatives of Pennsylvania Governor Dick Thornburgh and the White House agreed to centralize and divide communication responsibilities. All statements on the status of TMI would come from Harold Denton, an NRC engineer whose frank manner of speaking at press conferences won acclaim from the local populace; the governor's office would address all matters regarding evacuation or other protective actions; and the White House would be the sole source of information on the federal relief effort. The commission credited this arrangement for bringing some coherence to official communications (President's Commission on the Accident at Three Mile Island 1979).

Most risk communication professionals recommend the centralization of communications in an emergency. Sandman, however, disagrees with the "speak with one voice" approach. He counsels his clients to authorize multiple spokespeople in emergencies and to keep as many people in the know as possible. He points to the reporters at TMI as an example of what happens when the media cannot find answers to their questions from official sources: they find other sources, who may or may not be informed.

Sandman acknowledges that his advocacy of multiple spokespeople in an emergency is a minority view but maintains that all parties are better served by an abundance of communication. "If there is confusion and you're trying to hide it, multiple spokespeople reveal the confusion," he explains. "Whether you consider that a good effect or a bad effect depends on whether you think that, in an emergency, information should be rationed, and scary or uncertain information should be suppressed. There are people who believe that in emergencies you don't really want the public to know that the utility thinks one thing and the NRC thinks another, or even worse, that the NRC on site has a very different vision of what's going on than the NRC in Bethesda. And if you've got multiple spokespeople, it's going to be clearer sooner that the NRC isn't talking to itself. I mean, obviously it's bad that they're not talking to each other, but is it bad that we found that out?"

Cleanup and Aftermath

The cleanup of the TMI accident began in August 1979 and was not completed until December 1993. During that time, 100 tons of uranium fuel were removed from the reactor. Some of the waste was shipped to Richland, Wash.; much of the fuel is now stored at the Idaho National Laboratory. Unit 2 was decommissioned in 1993 and is now in long-term monitored storage.

The TMI accident delivered an estimated individual radiation dose of 1 millirem to the maximally-exposed member of the surrounding population (about 2 million people). The annual individual natural background radiation dose for the area surrounding TMI is about 100–125 millirem (WNA 2001).

According to the NRC, the accident led to a number of improvements in safety and operator training, including upgrades in plant design, more frequent inspections, streamlined instrumentation, periodic public reports on plant performance, and the identification of "human performance as a critical part of safety" (NRC 2004).

So far, at least, these improvements have not been enough to revive the nuclear power industry. Berger points to developments in reactor design and a recent increase in planned plant constructions as signs that the industry is gaining traction. The new designs, she says, are "much newer technologies. [They are] much more standardized. [It's] much easier for regulators to understand them, much easier for information to be shared, much easier for oversight groups to watch them. It's a totally different story than it was back in the fifties and sixties [when most existing nuclear plants were built]."

Sandman takes a dimmer view of the industry's prospects. He argues that the industry is still beset by communication problems so severe that it has not been able to capitalize on developments that should have sparked a renaissance. "Two big wars in the Gulf," he says. "Peak oil. Global warming. The discovery of major environmental impacts of fossil fuels other than global warming–PM_{10}, $PM_{2.5}$. Asthma rates through the roof. Our understanding of how bad–not just bad for the environment, but bad for peace, bad for stability, unsustainable, insupportable is our reliance on fossil fuels. And it's still hotly controversial to consider nuclear energy part of the solution."

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