

Hearing on “Three Mile Island: Thirty Years of Lessons Learned”

Testimony of Peter A. Bradford
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I'd like to begin with a review of the status of nuclear power and nuclear regulation the day before the accident at Three Mile Island. As of that time, the NRC's licensing process, maligned though it often was, had issued more licenses than the next five nations combined, though half of the construction permit recipients did not complete their power plants.

Some of those licensing hearings had been contentious, but they had not delayed the plants because they either preceded construction or went on while the plants were being built.

However, many plants were being cancelled or delayed by their owners in the face of rising costs and falling demand. Even the very high oil prices and supply uncertainty occasioned by OPEC's successes could not offset the facts that electricity prices had tripled in the U.S. in the 1970s and that surprising events in the operating plants had caused many cost estimates to double and then double again. A few would increase tenfold in the years ahead.

In Congress, the principal focus was on the Nuclear Siting and Licensing Act of 1979. It was intended to create a one stop licensing process and limit opportunities to litigate issues repeatedly and late in the process. On the morning of March 31, 1979, as Energy Secretary Jim Schlesinger – not suspecting the seriousness of the accident by then two days underway at Three Mile Island - was testifying before the Congress on ways to expedite the nuclear licensing process, NRC Chairman Joe Hendrie was transmitting the NRC's evacuation to Governor Thornburgh in Harrisburg.

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Here are some of the critical events from the months immediately before the accident:

- The price of oil reached \$40 per barrel in 1979 dollars, which would be around \$115 per barrel in today's dollars. Gasoline lines stretched for blocks here in Washington. Eliminating oil dependence in the electric sector was said to justify building otherwise uneconomic nuclear units, even as climate change does today.
- The NRC ordered the shutdown of five nuclear power plants based on errors discovered in a computer code used to assess the stresses on power plant piping during an earthquake. For this action, the Commission was summoned before Congressional committees and criticized in terms such as "asinine" and "stupid" by the some Congressmen.
- The movie "The China Syndrome" starring Jack Lemmon and Jane Fonda was released in March, 1979 and was a big hit, with industry spokesmen expending great effort to explain that the accident sequence depicted in the movie could not happen.
- The projected opening date for a spent fuel repository was postponed from 1985 to 1988, sparking considerable dismay in the industry and elsewhere.

- And an NRC inspector named Jim Creswell came to see Commissioner John Ahearne and me to stress his concern that - based on an earlier accident at the Davis-Besse plant in Ohio - all nine of the plants of the TMI design were unsafe and should be shut down until the problem was fixed. We were troubled by several aspects of Creswell's presentation, which foretold TMI in significant respects, but he requested that his identity be protected. This required us to devise a cover for our follow-up on his concerns. We were not to have time to pursue that undertaking, for Creswell's visit occurred on March 22, 1979. The Three Mile Island accident was six days away.

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The accident at Three Mile Island taught different lessons to different people. One implausible example was an advertisement that ran across two full pages in many prominent newspapers a few months after the accident. This ad featured a picture of the nuclear physicist Edward Teller under the caption, in very large bold-faced type, **"I WAS THE ONLY VICTIM OF THREE MILE ISLAND"**.

Dr. Teller, who had years earlier been a pioneering proponent of nuclear power and nuclear safety, was nowhere near the accident. He had suffered a heart attack a few weeks later because, he asserted in the ad, he had been working 20 hour days to refute the anti-nuclear propaganda being "spewed to the news media by Ralph Nader, Jane Fonda and their kind". Dr. Teller offered his readers several lessons from the accident.

The least controversial - and one which I think has proven true - was that nuclear safety would improve as a result of the accident.

More problematic was Dr. Teller's conclusion that the accident showed "that nuclear reactors are even safer than we thought".

Most problematic was Dr. Teller's conclusion that "unless the political trend toward energy development changes rapidly, there may not be a United States in the 21st Century." Dr. Teller feared also that his grandson Eric might grow up under Soviet Communism, presumably in the event that US energy policymaking's trend away from nuclear energy went uncorrected.

We did stop building new nuclear plants, but Dr. Teller's grandson does not seem to have suffered. Now called Astro Teller, he specializes in artificial intelligence and has published a novel. It is Soviet communism that is defunct.

After the accident at Three Mile Island, the Soviet Union sent a delegation to the TMI site. The delegation held a press conference. The TMI design, they pointed out, was unique to the U.S. Nothing like TMI could occur in their country, and, of course, they were right. The Chernobyl accident was quite different.

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The story of the accident has been exhaustively told and retold. Some tend to minimize its significance because the hydrogen bubble that caused such widespread public concern on the accident's third, fourth and fifth days had never been a problem. However, a full appraisal of those five days must also acknowledge that the greatest danger was during the first two days, when no one knew what was going on in the reactor core, when the NRC commissioners were working on other matters. We know now, as a

result of examinations of the reactor core that were not possible for several years, that the melting of the core during the early hours of the accident was far more severe than was known at the time, indeed that half of the core had melted.

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A principal conclusion of the Kemeny Commission, appointed by President Carter to investigate the accident, was "After many years of operation of nuclear plants, with no evidence that any member of the general public has been hurt, the belief that nuclear power plants are sufficiently safe grew into a conviction.....This attitude must be changed to one that says nuclear power is by its very nature potentially dangerous, and, therefore one must continually question whether the safeguards already in place are sufficient to prevent major accidents."

That lesson, that safety must always be a higher priority than economic interest or the licensing of more power plants in specified time periods is one that needs constant reiteration. Among the lessons of TMI is that nuclear power is least safe when complacency and pressure to expedite are highest. The sense that everything is safe enough already may be its worst enemy.

Nuclear power performance has improved. Perhaps the industry is - waste management aside - about where it would have been if its handlers had proceeded with appropriate caution in the 60s and 70s. But there have been uncomfortable events in some plants in recent years – especially the near rupture of the reactor vessel at Davis Besse in Ohio. That event, which the NRC’s Inspector General ascribed in part to undue solicitude for the profits of the licensee, came too close to renewing our acquaintance with a nuclear power plant out of control, operating beyond the understanding of those in the control room.

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When TMI is seen together with the fire at Brown's Ferry four years earlier, the fuel cladding failures, the Emergency Core Cooling System shortcomings, the seismic design retrofits and the absence of offsite emergency plans, a clear picture emerges of a technology that had rushed far ahead of its operating experience. The nuclear regulatory problem illustrated by the accident at Three Mile Island was not – as is widely asserted today – that the U.S. had licensed too many plants too slowly. It was that we had licensed – and made large financial commitments to – too many plants too quickly. That is why within a decade of the TMI accident we had a landscape dotted with nine figure cost overruns, a nine figure accident, eight figure cancellations and eight figure mishaps in such areas as steam generator tubes, pressure vessels, seismic design and quality assurance.

From an economic and a political standpoint, TMI was only one of many nine figure accidents. Some of the others were at Shoreham, Seabrook, Nine Mile Point, Midland, Zimmer, Marble Hill, WPPSS, Byron, Braidwood, Grand Gulf, Comanche Peak, South Texas and Diablo Canyon. Every state across the

northern tier from Illinois to Maine was involved in at least one.

NRC hearings did not cause Three Mile Island. NRC hearings did not bring about the cancellation and bond default at the WPPSS units. NRC hearings had nothing to do with the quality assurance breakdowns at Diablo Canyon and Zimmer. NRC hearings did not cause the diesel generator building at Midland to sink into the soil or the tenfold cost overruns at the never-operated Shoreham nuclear plant in New York.

In 1968, the largest plant in operation was one half the size of the smallest plant under construction and one-sixth the size of the largest. This was as if the airline industry had gone from Kitty Hawk to jumbo jets in 15 years. In 1972 the Atomic Energy Commission forecast that the country would have a thousand nuclear power plants by the year 2000, complete with breeder reactors, reprocessing plants and, of course, waste repositories. This would have required the regulators to issue a construction or an operating license every week for the next 28 years, a pace that could not possibly have been sustained. In hindsight, trouble and disappointment were inevitable. The only question was how much.

The lessons for economic regulation and energy policymaking were at least as abiding. Wall Street learned that a group of licensed operators no worse than any other could transform a billion-dollar asset into a two billion dollar clean-up in ninety minutes. No more nuclear plants were ordered in the U.S., and none started after 1974 were completed.

At first, the lessons for the economic regulators from these costly disasters seemed to be to regulate more and better. The quality of state commission appointments improved, as did the budgets. The mandates expanded as regulators were told to further energy efficiency, undertake integrated resource planning, perform management audits and make a market for power plants built by nonutility companies. For a time, this mix sufficed, for energy efficiency more than filled any void created by the nuclear cancellations.

But the regulatory assumptions - such as hundred dollar a barrel oil and limited natural gas - eventually produced their own price surges and with them came a skepticism as to whether any system based on locking the forecasts of state and industry officials into long-term arrangements was likely to be superior to giving freer rein to customer choice. This skepticism was reinforced by the fact that the newly competitive power supply market produced falling construction and fuel costs where regulatory and nuclear orthodoxy had foreseen only endless increase.

And so we had electric utility restructuring, an event largely traceable to the overly exuberant nuclear construction experience that TMI embodied but did not cause.

With competition came new cost pressure and a shift in risk from customers to investors. It is that risk shift, not Three Mile Island or NRC regulation that explain the fact that we had no new nuclear orders for decades after TMI.

It is a hard time to generalize. Nuclear power provided 12% of the nation's electricity at the time of TMI. It provides 20% today. The number of events of safety concern has declined. The operating costs of the plants have been trimmed far below levels prevailing few years ago, though not to levels that make new nuclear units able to attract private capital without government shifting of risks to investors or to taxpayers.

Finally, a word about the lessons of Three Mile Island for Congressional Oversight. If the message that the NRC gets from the Congressional oversight committees is that what's wanted is strong commission focus

on expedited licensing of new reactors and deemphasized enforcement, that message will have an effect over time. Senator Pete Domenici asserted in his 1998 book that he singled-handedly changed NRCs priorities in a 1998 meeting with the NRC chair in which he threatened to cut the agency's budget by one-third if the NRC did not modify its "adversarial attitude" toward the industry.

This doesn't seem to me to be the type of oversight that the Kemeny Commission had in mind.