STATEMENT OF
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BEFORE
SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY
SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

"THREE MILE ISLAND – LOOKING BACK ON THIRTY YEARS OF LESSONS LEARNED"

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Mr. Chairman and members of the Committee, I am pleased to have this opportunity to discuss, from today's perspective, safety lessons learned from the accident at the Three Mile Island Unit 2 nuclear power plant.

On Friday morning following the accident, Chairman Hendrie requested that I go to the site and take charge of the NRC response. I would be President Carter's contact and work closely with Governor Richard Thornburgh of Pennsylvania. A few hours later, the White House sent a helicopter to take me and staff members to the plant site. On arrival, I asked the utility to inform us in advance of any planned changes in the status of the plant and of any unusual events. We initiated around the clock coverage in the control room and in a command trailer. Within days there were over 100 NRC staff at the site. An industry support group for the plant management was also assembling at the site.

The President asked to kept fully informed and set specific times for morning and afternoon briefings. In addition, he indicated that all necessary Federal resources would be made available to achieve a safe resolution of the crisis. I briefed the Governor each evening and as events required. He and I held a press conference each night in the capitol. Daily, I briefed the public in nearby Middletown.

I had never met President Carter or Governor Thornburgh. Their appreciation of the gravity of the situation, and their direct personal involvement led to remarkable cooperation during the crisis. Bureaucracy was set aside. For example I never signed any paperwork throughout those weeks. The military provided invaluable logistical support by bringing people and equipment from around the country to the site. The Department of Energy conducted extensive environmental sampling and monitoring. Mobile phones for use by the ever growing NRC staff onsite were borrowed from the Forest Service. My three weeks on site were challenging, hectic and, at times, surreal.
A widely held view at the time of the accident and for years afterwards, was that most damage was confined to fuel cladding, and not to fuel pellets themselves. This view was inferred from measurements outside the containment and from computer simulations. However, the first visual examination of the reactor core showed a drastically different picture. The uppermost fuel assemblies were completely destroyed. Subsequent research revealed that at least 45% of the core was melted.

The critical phase of the accident was actually over by Wednesday morning. Operators turned off redundant emergency core cooling water systems although the reactor was actually losing water continuously through a failed valve. No core damage would have occurred if the emergency pumps, which started automatically, had been left running instead of being shut off. About 100 minutes into the accident, fuel at the top of the core was uncovered and began to overheat. As the water level in the core fell, more and more of the central core melted, flowed downward and solidified when it reached water. Approximately four hours later, nearly 20 tons of molten material reached the bottom of the reactor vessel. A circular area at the bottom of the vessel reached extremely high temperatures for about thirty minutes before cooling. At 16 hours into the accident, operators managed to restart pumps thereby re-establishing water flow and stabilizing core conditions.

A robust containment structure proved valuable as off-site radiological consequences of the TMI accident were minimal. The use of a leak tight containment preventing a significant release of radioactive materials can be traced to the foresight of a blue-ribbon safety committee of the Atomic Energy Commission in 1947. At its' first meeting, the committee considered a containment concept to prevent serious releases of radiation to the environment in an accident situation. Since then, containment structures have been a required safety feature of commercial reactors. During the TMI accident, the amount of Iodine 131 (a particularly hazardous radionuclide) released to the environment was about a million times less than that released as a result of the uncontained Chernobyl accident in the Ukraine. The possibility of penetration of a containment basemat by a molten core i.e. China syndrome, had not been studied extensively. Based on research information now available on failure mechanisms, and industry studies, it is unlikely that the TMI containment would have failed even if the hot core had reached the thick concrete basemat.

A hydrogen explosion occurred inside the reactor containment on the first day of the accident. Thus, the possibility of an explosion in a hydrogen bubble within the reactor vessel was explored. The bubble concern arose when it was realized that a large bubble of hydrogen might burn or explode if sufficient oxygen was present. It was recognized that oxygen was being generated over time from radiolytic decomposition of water. Unfortunately, the phenomenon was initially modeled incorrectly, and neglected the an all important chemical reaction which would cause the oxygen to recombine with dissolved hydrogen in the water essentially as soon as it was formed. My deputy at the site NRC's Victor Stello, had concluded by Saturday night that no explosion was was possible at any time.. Unfortunately, this factor was not sufficiently appreciated initially, and led to the near-hysteria in the Harrisburg area on Saturday night. By Monday, April 2, the operators had mooted the question by reducing the size of the "bubble" to an insignificant level.

The accident was comprehensively examined by a number of official studies and investigations, including the President's Commission on the Accident at Three Mile Island, an NRC Special Inquiry Group, the Congress, the General Accounting Office, and the State of Pennsylvania. Although the accident was the result of many deficiencies, the most significant causes were in the area of operational safety. This includes qualifications and training of the plant staff and management, as well as NRC's licensing and inspection of operating plants.

Follow up recommendations for all sites included the expanded use of plant simulators, improvements both in the content and level of training, and in procedures and design of control rooms. Changes resulting from the accident have significantly reduced the overall risks of a future serious accident. Today, reactors are operating far more safely and reliably than ever. The number of precursor events that could presage another severe accident has declined markedly. Another significant outgrowth of the accident was the creation of the Federal Emergency Management Agency by President Carter. This agency is responsible for off-site planning for nuclear emergencies and reviewing state emergency plans.

Nuclear power plants being considered by industry today are designed to minimize events that could lead to a need for safety system action. They also provide improved means for operators to recognize and take appropriate corrective actions. France and Japan have continued their nuclear power programs while ours have languished since TMI. They have benefited from the learning curve associated with a single reactor design.

Much of the specialized industry capability that existed at one time in the U.S. has disappeared. Special NRC attention to procurement and testing of components for any new plant construction appears warranted. Even Finland, which is building one of the advanced French designs, has encountered delays and cost overruns due to poor quality controls.

In conclusion, nuclear power plants in the U.S. are safer today than ever. Federal and State Governments as well as Utilities, are much better prepared to deal with an emergency, should another one occur.