NEW YORK TIMES

May 20, 1986

U.S. nuclear industry is right to be defensive but wrong when it asserts it can't happen here. Containment buildings are not failsafe."

Estimate of Chernobyl: Below U.S. Standards

Donald C. Winston, public relations director of the Atomic Industrial Forum, said that "probably there was a little bit of simplification" in its statement. "What we probably should have said is that Chernobyl did not have a containment that would be licensed in this country," he added.

American nuclear experts concurred, saying they believed, based on the little hard evidence available, that despite the addition of its new safety features the Chernobyl plant would probably not have met N.R.C. safety requirements.

Dr. E. Linn Draper, president of the American Nuclear Society and of the Gulf States Utilities Company and a board member of the U.S. Committee for Energy Awareness, said it did appear that some structures in Soviet and American reactors were designed to withstand similar pressures. But he asserted: "It is not whether the pressures are equal or not but whether the systems as designed are adequate to withstand accidents. Whatever was designed at Chernobyl was inadequate. It plainly failed."

Chernobyl unit 4 had a variety of features to contain excessive steam and radiation and reduce accident effects. According to Dr. Edwin L. Zebroski, chief nuclear scientist at the Electric Power Research Institute in Palo Alto, Calif., the Chernobyl reactor was surrounded by a heavy structure 200 feet long, 70 feet high and 70 feet wide.

The structure is inside the heavily damaged reactor building and has steel walls 1 to 2 feet thick backed by concrete 6 to 8 feet thick, said Dr. Zebroski, who has visited Soviet reactors and was working from design drawings, copies of which were provided to The New York Times.

There was also a water pool in the basement of the Chernobyl building, holding several million gallons, to quench steam in an accident, he said. The pool is called a "bubbling pond" in the Soviet reactor and a "suppression pool" in the 40 American reactors that incorporate it, including the Shoreham plant being proposed for commercial operation on Long Island. Pipes conducting the steam lead into the pool from the reactor area above. The area around the reactor also has a nonflammable "inert" atmosphere containing nitrogen to stifle combustion, as in American units.

Soviet reactor experts at the International Atomic Energy Agency said through a spokesman by phone from Vienna, "The primary containment is divided into a number of hermetically sealed compartments around the reactor, housing various important components." They would not elaborate.

Barriers of Steel And Concrete Described

Regulatory Commission staff members, in a search of Soviet technical literature, have concluded that there were two types of steel and concrete barriers around the Soviet reactor. One could withstand a gauge pressure of 27 pounds per square inch, and the other, 57 pounds. Most American units are built to withstand 55 to 65 pounds, and a few, with huge storage bins of ice to condense steam and thereby reduce pressure, need containments of only 12 to 15 pounds, experts said. Shoreham is designed to withstand 48 pounds, which the N.R.C. considers adequate.

Around each primary containment is a building, called a secondary containment. In pressurized water reactors such as Three Mile Island, they can contain high pressures. In boiling water reactors such as Shoreham, the secondary containment is more like the building that blew apart at Chernobyl and is not designed to take a powerful explosion, experts said. The water pool relieves some of the pressure, allowing the secondary containment to be less sturdy. Some experts call such structures "confinements."

But there are many uncertainties, intensely discussed in private meetings around the country and in Washington over the last week.

Dr. Sheron of the N.R.C. said Chernobyl's barriers enclose a smaller volume than American plants do, meaning a faster and stronger pressure build-up inside the Soviet unit.

Dr. Zebroski said the Chernobyl walls could take less pressure because they were straight, not rounded, making it difficult to make direct comparisons of pressure ratings. He suggested that the top of the reactor was not adequate to contain the pressure, since 3,000 fuel tubes, pipes and other conduits penetrate its thick steel and concrete structure, about one per square foot. He suggested the seals were not leak-proof.

A week ago, the N.R.C. staff said the sides of the reactor acted as a pressure barrier. But after studying their documents further, they now say that the pressure barrier was below the core and that the massive structure around it was not built to withstand an explosion, according to Victor Stello, the agency's top staff official.

"It is our best judgment today," he said Friday. "It is not an easy issue." He said there was still a lot of uncertainty.

Design Differences And Similarities

Dr. Zebroski also said the Chernobyl unit apparently was not designed, as are American reactors, to neutralize the large volume of explosive hydrogen that could be generated in an accident.

But others are unconvinced such differences are relevant to American reactors."

A fire apparently destroyed the power cables that operated Chernobyl's safety equipment, even though the Soviet plant had redundant cables separated from one another by concrete, as in American reactors, some experts say.

Soviet officials said the accident was started by a sudden rise in reactor power. American engineers have worried about accidents in which control rods do not insert on command to stop the chain reaction, a situation that has occurred at least four times here, but without a major accident.

The N.R.C. last year ordered utility companies to develop means to neutralize hydrogen buildups, after a hydrogen burn of 28-pounds per square inch inside Three Mile Island. Even with the new equipment, however, the agency said American containments might burst in some cases if more than 75 percent of the potential hydrogen produced during nuclear reactions escaped from the reactor vessel.

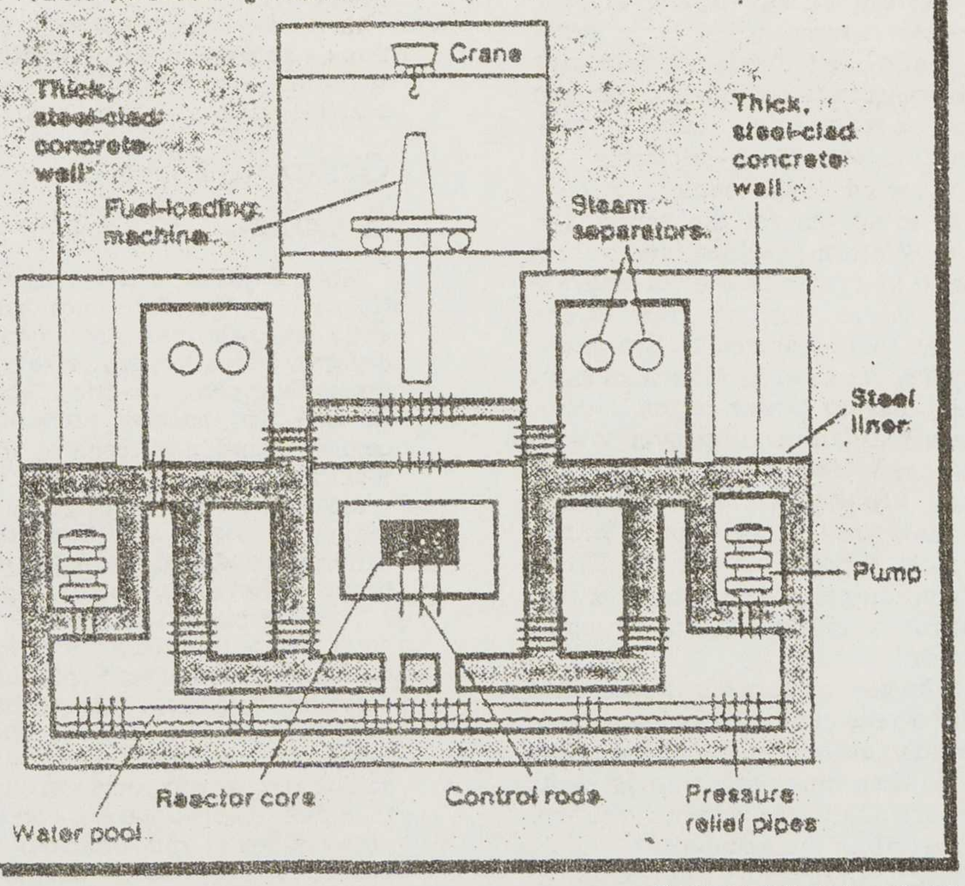
Dr. Zebroski suggested that the initial hydrogen explosion in the Chernobyl reactor caused a giant overhead crane and refueling machine to fall onto the reactor, causing further damage. Most American nuclear plants have similar cranes over the reactor vessel.

Dr. Herbert Kouts, chairman of the Department of Nuclear Energy at Brookhaven National Laboratory, said American nuclear experts should study potential accidents that start from fires and other causes that overcome many safety systems at once. One possibility, thought by some experts to have come to reality at Chernobyl, is total loss of power, an issue of continuing concern here.

"The message is not whether the Russian plant is as safe as ours," Mr. Bernero of the N.R.C. said. "The question is whether we understand our own reactors well enough. Did the Russians have something there that we have missed?"

Chernobyl Unit 4 Reactor Design

1,000 megawatts at full power. Nuclear fuel rods are in 1,700 water-filled pressure tubes surrounded by nearly 2,000 tons of graphite, which absorbs neutrons to control chain reaction. Around graphite is a steel liner containing inert atmosphere of nitrogen and helium to prevent combustion. Around that is a very heavy structure of steel and concrete designed to shield workers and to contain excessive steam pressure or other problems. Huge water pool, below, can quench steam in an accident. Crane and refueling machines, above, are thought to have fallen onto reactor, worsening accident.



The New York Times / May 18, 1986