

ISSUES AND EVENTS

Security at US Nuclear Power Plants Boosted after Terrorist Attacks

When Richard Meserve, chairman of the Nuclear Regulatory Commission, heard that terrorists had crashed two airliners into the World Trade Center and that other planes might have been hijacked, he put US nuclear power plants on full alert. Within 40 minutes, the NRC's regional offices and its emergency response operations center were coordinating data from all 103 nuclear power plants.

While the NRC has typically worried about small leaks, temporary reactor shutdowns, and training exercises, the concern now is that if terrorists crash a 180-ton aircraft loaded with fuel into a nuclear power plant the impact and explosion could breach the reactor containment walls and contaminate a wide area with radiation. "No power plant in the world could withstand an airborne terror attack like the one on September 11," says a spokeswoman for the association of German electric power utilities. Edwin Lyman, from the Nuclear Control Institute (NCI) in Washington, DC, agrees: "The possibility of an unmitigated loss-of-coolant accident and significant release of radiation into the environment is a very real one."

Long before 11 September, some experts had raised concerns about the ability of a nuclear power plant to withstand being hit by a commercial airliner. The scenario envisioned an accidental crash, not the intentional use of a plane as a missile. In 1982 the Department of Energy's Argonne National Laboratory conducted a study on the speeds and angles at which a jetliner impact could pierce the thick concrete containment walls that protect reactors. The report said that significant damage to the containment walls and the reactor cooling system would be likely because of a secondary explosion from the airplane's fuel tanks. Now the NRC is reevaluating and updating the DOE research with new computer simulations, and is planning to publish a restricted report this month. Research into the design of new power plants is also being reevaluated in light of the recent terrorist attacks. "Most of the new reactor designs are at the beginning of their

With the ongoing threat of terrorist attacks, nuclear regulators ponder how to protect the public from a radiation disaster.

research," says Neil Todreas of MIT's nuclear engineering department. "So there's time to anticipate this type of sabotage into the design."

US security requirements are defined by regulations that specify the sabotage dangers that a power plant must be protected against to be licensed by the NRC. "We carry out frequent inspections to make sure that [the power plants] have the capacity to defend," says Meserve. Although ground attacks are part of the protection specification, surviving a deliberate airplane crash is not, a policy that the NRC is now reviewing.

Lessons learned

To see how US plant operators respond to security threats, the NRC regularly stages simulated attacks. "The simulation scenarios are usually kept secret from the participants so that their responses will be real," says Meserve. Usually they consist of an armed group of four or five assailants who attempt to sabotage a plant or storm its control room. Nearly half the plants have failed these attack tests in the past decade. Even before 11 September, the NRC had decided to increase the frequency of staged attacks from every eight years to every three years. In the future, the mock attacks will be planned and carried out by the nuclear plant opera-

tors themselves, not the NRC. "It is not at all clear that the new regimen will be an improvement over the old," says the NCI's Lyman.

All US nuclear power plants have remained at the highest alert level since the 11 September attacks. To keep plant operators informed of new security requirements, the NRC has been sending out updates by telephone, fax, and e-mail. "It's quicker to get action on an information circular than it is to introduce new regulations," says Meserve. "There are resident inspectors at every plant, monitoring what is going on. If any power plant didn't comply [with new NRC recommendations], we would know about it more or less immediately," he says.

Spurred by warnings in mid-October by the FBI of more possible terrorist attacks, the NRC and other agencies have modified their Web sites, significantly decreasing the amount of technical data accessible to the public. Thousands of documents on nuclear power plant engineering specifications and design criteria—including the 1982 Argonne report—have been removed. Exelon and Duke Energy, two major commercial nuclear plant operators, also have removed from the Web technical information regarding their plant designs.

Agencies cooperate

Coordination among federal, state, and local law-enforcement agencies has improved as a result of recent events, says Meserve. The NRC has taken steps to link with the FBI's Strategic Information Operations Center in Washington, DC, which is now acting as chief coordinator among the agencies dealing with terrorist threats. And the intelligence community is passing information to the NRC for risk analysis. How Tom Ridge, head of the new Office of Homeland Security, will interact with the agencies is not yet known. The NRC is also coordinating new discussions about existing power

plant security with military officials and state and local authorities. As of early November, 10 of the 32 states that generate nuclear power had deployed small numbers of National Guard and

SANDIA NATIONAL LABORATORIES



UNLIKE THIS JET FIGHTER, which vaporized in a collision with a wall similar to those used in nuclear power plants, experts fear a commercial jet could breach reactor containment walls.

US Coast Guard personnel to power plants.

University reactors, despite being about 600 times smaller than commercial reactors, also operate under NRC guidelines. They, too, have tightened security, stationing armed guards at reactor sites.

At the same time, the heightened security is increasing the number of false alarms. For example, in October a threat against the Three Mile Island nuclear power plant in Pennsylvania led to the closure of two nearby airports for four hours. As resources become stretched, government authorities worry they won't be able to meet the demand for increased security. Some state officials, such as Governor George Ryan of Illinois, are trying to get emergency spending bills passed to help pay for protecting their state's nuclear power plants. Meserve agrees that money could soon be a problem, "In the longer term, it's a serious question for power plant operators and other critical infrastructure assets over who will pay."

Another worry for commercial reactor operators is whether a hostile and fearful public climate will dash plans to extend the lifetime of existing nuclear power plants. "We feel that nuclear still has a future, and we believe that we have proved ourselves to the NRC... that we can meet their security and operating standards," says Tom Shiel from Duke Energy.

PAUL GUINNESSY

IAEA Calls for Tighter Security Worldwide

Mohamed ElBaradei, director general of the International Atomic Energy Agency, is calling on the world to tighten security at civilian nuclear plants to avoid their being targeted by terrorists. The September attacks on the US were a "wake-up call," he told the United Nations General Assembly in New York. Some nuclear regulatory bodies are already tightening security—for example, by putting fighter aircraft on patrol near reactors. France has installed missiles at its Cap de la Hague nuclear reprocessing plant. And Germany's Environment Minister Jürgen Trittin may close his country's nuclear reactors if the risks from attack are deemed too high by a security review panel.

But theft of nuclear material, not terrorist attacks on reactors, still poses the greatest danger, the IAEA warns (see PHYSICS TODAY, July 2001, page 29). Twice earlier this year, terrorists were caught spying on a Russian nuclear storage site, Russia's military nuclear security head Igor Volynkin said on television, according to the IAEA Web site. And in April, 600 grams of highly enriched uranium with a black-market value of \$1.5 million was recovered in Colombia. Instead of creating an atomic bomb, a terrorist group might simply attach radioactive material to a conventional weapon to make a "dirty bomb." The effects of the resulting radioactive contamination could be devastating. Even relatively small amounts of radioactive material can cause serious problems. In 1987, Brazilian scavengers stole a 20-gram capsule of cesium-137 and sold it to a scrap yard in the city of Goiânia. Nearly 250 people became sick and another 110 000 will have to be monitored for the rest of their lives. "The deadliness of handling intensely radioactive material can no longer be seen as an effective deterrent," says Abel Gonzalez, the IAEA's director of radiation and waste safety. IAEA officials have initiated a thorough review of the organization's activities and are considering creating a fund to help countries protect against nuclear terrorism. "There have been two nuclear shocks to the world already—the Chernobyl accident and the IAEA's discovery of Iraq's clandestine nuclear weapons program," says ElBaradei. "It will be vital that we do all in our power to prevent a third."

In some cases, employees of nuclear facilities are suspect. In Pakistan this October, physicists Bashiruddin Mahmood and Chaudry Abdul Majeed, past members of the Pakistan Atomic Energy Commission, were taken into "protective custody" by the government amid fears about their close links with the Taliban. Says ElBaradei, "These are unconventional threats that require unconventional responses."

PAUL GUINNESSY

CERN Grapples with LHC Cost Hike

Nobody doubts that the Large Hadron Collider (LHC) being built at CERN is technically robust or that it will produce spectacular science once it starts smashing protons together. But the project is in trouble financially: Managers at CERN, which straddles the border of France and Switzerland, revealed in September that costs have crept 850 million Swiss francs (roughly \$514 million) above the allotted 2.6 billion Swiss francs. Now they are scrambling to come up with a plan to pay the extra price.

CERN faults the original budget for not having any contingency. "When the LHC was approved in 1996," says Roger Cashmore, the lab's director of research for collider programs, "[the governing] council gave us, as an extra present, a 900 million Swiss franc budget cut, so it was a very tough deal that we struck—to build a new high-tech accelerator with a cut to personnel and money." (See PHYSICS TODAY, February 1997, page 58.)

▶ Cutbacks, loans, project slowdown, and new money could all contribute to paying the extra costs of the Large Hadron Collider and to restoring CERN's reputation.

The size and suddenness of the price hike came as a shock, say CERN scientists and council members, who represent the lab's 20 member states. CERN management "didn't take the tight budget seriously enough. This is

proved because they started new programs. They don't have the mentality of doing things at cost," says council vice president Hermann Schunck, from Germany's research ministry. "How did they get into this without warning us earlier?" asks British delegate Ian Halliday, head of the UK's Particle Physics and Astronomy Research Council.

Indeed, many high-energy physicists and policy-makers worry that the LHC overruns reflect badly on the

field and could have ripple effects on other current and future high-energy projects. "What CERN has blown over the past few months is

CERN STAFF ASSOCIATION



WHEN THE BUDGET for the Large Hadron Collider was being set a few years ago, CERN staff members warned that it was draconian.