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Date: 6/21/96 10:24pm
Subject: HARTFORD ADVOCATE

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HARTFORD ADVOCATE
June 19, 1996
Cover Story

Crunch Time for the NRC

George Galatis and Millstone are forcing federal regulators to reassess how they do business

By Michael Kuczkowski

At first glance, the pool looks quite unremarkable. It is a placid deep blue, with just the slightest ripple over the surface from the air that is constantly circulating throughout the building. But then, this is not just any pool. It is surrounded by urgent yellow metal handrails and located inside a building that resembles an airplane hangar. Security here is tighter than at the Pentagon. Thanks to a series of underwater floodlights, two sets of giant honeycombs made of stainless steel and Boraflex, a neutron-absorbing material, are visible beneath the surface. The tops of the steel racks are 24 feet underwater. The pool itself is 40 feet deep. Inside those honeycombs are ten years' worth of spent bundles of potentially lethal nuclear fuel.

This is the spent-fuel pool at the Millstone 3 nuclear power plant in Waterford. It is where Northeast Utilities stores radioactive fuel bundles after they are no longer producing high levels of heat during the nuclear fission process that drives this \$3 billion, 1200 megawatt power plant. Northeast's spent-fuel pool practices have been the subject of unprecedented criticism in the past year that in turn has seriously undermined the credibility of the nuclear industry in general and the Nuclear Regulatory Commission in particular.

George Galatis, a nuclear engineer who works for Northeast, has been the source of much of the criticism of the spent-fuel pools, Northeast Utilities and the industry over the past year. About two hours after I visited the pool, I told Galatis about my tour of the Millstone site. xOh,x he said, not missing a beat. xSo can you tell me if itxs safe?x

A rigorous series of security precautions are taken for every person who enters the site. A dosimeter that measures amounts of radioactive exposure was hanging from my neck throughout my tour, and only measured the smallest traces of radiation. Everything certainly looked sturdy. That was Galatis' point. Radiation is colorless, odorless, tasteless and deadly. You can't tell from looking at anything whether it's safe or not.

It was Galatis' job to make sure Millstone 1, the oldest of the three Millstone plants, operated safely. But when he started to question the utility's operating practices four years ago, particularly its practice of off-loading entire cores of nuclear fuel into the spent fuel pools for refueling purposes, it sparked a chain of events that landed him on the cover

of Time magazine, led to the shutdown of all three of Northeast's Millstone plants and brought unprecedented scrutiny down on the utility as well as the NRC, the agency that is responsible for overseeing the operation of the 110 nuclear power plants across the country.

Galatis's case dealt a crushing blow to Northeast Utilities. He also reminded a beleaguered industry that, for want of a long-term storage depository for nuclear fuel, spent-fuel pools at power plants around the country have become clogged with old fuel, turning them into de facto high-level radioactive waste dumps. What has received far less comment is the blow Galatis and other NU whistle-blowers delivered to the NRC itself. Unless the NRC can shape up and convince the public that nuclear power plants can be operated safely and that spent fuel can be stored safely, the nuclear power industry could become a dinosaur. Lest we forget, this is an industry which now provides 20 percent of the country's electrical power and between 50 and 70 percent of Connecticut's energy. Bluntly speaking, it is an energy source that we cannot afford to abandon.

Yet because of the potentially dire consequences of a nuclear accident, we can no longer afford a regulatory body that continues to oversee the industry in the lax and cozy manner it has managed the spiraling problems of Northeast Utilities. NU may be in serious trouble. But it is crunch time for the NRC and past time for tough reform of how the federal government regulates nuclear power.

[DROPCAP] Nobody knows this better than the NRC itself. At a trade symposium in Florida earlier this month, NRC member Kenneth C. Rogers acknowledged that Millstone has had a dramatic effect on the way the NRC has to go about business. "The events at several nuclear plants in New England and the resulting media attention have seriously set back the credibility of the industry and the credibility of the NRC," Rogers said. "Neither of us can afford that."

Rogers' speech implicitly acknowledged a tension that has existed within the NRC since its beginnings in the early 1970s. Its predecessor, the Atomic Energy Commission, was the federal agency that had watched over the fledgling nuclear industry since World War II. That agency's mission was to promote nuclear energy as well as monitor the industry. The rise of the civilian nuclear power industry and increasing concern about public safety, among other things, led to the formation of the NRC in 1974. Virtually from the outset, critics have found fault with the NRC for operating too cozily with the utilities it regulates. For years, NRC regulators have enjoyed a revolving-door entree to jobs in the industry and opened the agency to criticism that resident inspectors regularly let safety violations slip.

Remarkably, the NRC has issued several reports essentially agreeing with its critics. Most deal directly with the Millstone plants, where the NRC now says it should have acted to put the plants on the commission's "watch list" years earlier.

The nuclear industry still enjoys a fairly high degree of public support. And it produces an enormous amount of electricity, especially in states like Connecticut. But since oil prices have remained fairly low in recent years, the economic competitiveness of the nukes has become suspect. Some plants are efficient compared with fossil-fuel burning plants, while others are not. A critical question, given new poignancy by the events at Millstone, is whether nuclear power can be cost efficient and still be safe?

The current evidence suggests that they can. That has led some nuclear industry watchdogs to talk about a new standard for determining what plants

stay open and what plants close: profitability. Since nuclear power plants are so incredibly expensive to build, utilities are loathe to shut them down. But, since safety seems to be a corner which utilities cut to achieve cheaper power production, economically inefficient plants can be disasters waiting to happen, according to Alan Noguee, a senior energy analyst at the Union of Concerned Scientists, a Cambridge, Massachusetts-based watchdog group.

"The real problem is, from a state economic perspective, you neither want to continue to subsidize an uneconomical plant, nor do you want to give the utilities incentives to cut corners," Noguee says. "And that means regulators doing their jobs and not leaving these decisions up to the marketplace."

[DROPCAP] Safety has been Galatis's mantra since 1992. That was when he first learned that Northeast Utilities was regularly placing entire reactor cores' worth of nuclear fuel rods into the spent fuel pools during the process of adding new fuel to the reactor core. The fuel rods from the core are radioactive and about 250 degrees Fahrenheit when they are taken out of the reactor. During refueling, the reactor vessel is flooded with water, the rods are pulled out of the core and a cooling system is used to keep the temperature of the water circulating between the reactor and the spent fuel pool below 100 degrees.

If an accident took place, due to some cataclysm from an earthquake to a failure of the cooling system, the cooling water could boil and vaporize, exposing the fuel rods and the old fuel bundles and leading to a meltdown of the entire system. The consequences could be, quite literally, lethal.

Galatis believed that Northeast should have tested to make sure that the concrete spent-fuel pool could handle the load. But NU engineers hadn't. He also found a rat's nest of safety hazards in the spent-fuel pool back-up systems. While procedures called for a 250-hour cool-down period before moving the fuel, workers were moving the core in less than 70 hours. Also, there were no earthquake-proof pipes going into the pool, to make sure that there would be a source of water if an earthquake snapped all the other lines. Firehoses that might have been used to pump water in from nearby Long Island Sound were too short or not up to safety standards.

To Galatis, Millstone 1 was a potentially devastating accident waiting to happen. He came to believe that the process of taking out the entire core was a violation of Northeast's NRC license. He argued that the license only allowed them to take out one-third of the core at a time. That's where the rub came for both Northeast and the NRC. In 1992, Northeast Utilities knew that it was the source of fully one-fourth of the nation's whistle-blower complaints. Company officials could not agree with Galatis. NU managers, all too aware that internal reports had already described a company culture in which employees felt that management did not really care about employee concerns, fought him on the issue. It was, as Northeast puts it now, a professional difference of opinion. But it wound up being a blast to the utility, and perhaps more significantly, the agency that is supposed to ensure the nukes are safe.

Anthony Castagno, the spokesman for Northeast's nuclear operations, was caught completely off-balance when Galatis' spent fuel-pool issues became the source of such intense media attention. "From a public relations point of view, I couldn't believe that this was even an issue," he says. "Its safety significance is just about zero."

Castagno makes an interesting argument. He points out that it was safer for workers who did maintenance to the reactor core if the fuel was not there while they worked. He also points out that, during the refueling process, the

same water that cools the reactor is circulating through the spent-fuel pool. On balance, the system has the same amount of heat no matter where the nuclear fuel is stored.

But it's not enough to just make sense when it comes to nuclear safety. Every detail has to be analyzed from an engineering standpoint to make sure the methods are safe. Northeast hadn't done that. Even more disturbing, the NRC knew about the practice and hadn't demanded a new safety study. Safety analysis takes into account a number of different factors, each of which can increase the risk of an accident exponentially. "The real issue is, those concrete structures, those big swimming pools, were really not designed to handle the loads they're handling," says Galatis. Worse than that, Galatis says that the NRC refused to quantify the consequences of different accident scenarios. In essence, NRC regulators will tell you what's wrong, but it won't tell you what could go wrong as a result.

Millstone 2, for example, was the site of a very hairy brush with nuclear disaster in 1993. Water was dripping from a valve in a two-inch water line that carries water out of the core of the nuclear reactor into a purification system. The valve in question was one of only a few in the plant that did not have a back-up system, so taking the valve apart to fix it would mean shutting down the whole plant.

Instead of ordering a costly shutdown, Northeast decided to try to plug the leak with sealant. It was, they say, standard procedure throughout the industry, ostensibly approved by the NRC. But, it was not an industry standard to keep plugging the leak in this manner for three months, as Northeast did.

On Aug. 5, a bolt in the valve cracked. Highly pressurized steam shot out of the valve. Workers fled the area, fixing a video camera on the valve so that they could watch it from a secured room. They watched, and luckily the valve held.

What were the odds of the valve bursting? Northeast officials now say that three of the four bolts on the valve could have broken without the valve bursting. Even giving them the benefit of the doubt, the odds are slim. What would have been the consequences of the valve bursting? Radioactive water would have poured out over the floor, and the reactor would have drained, possibly leading to a meltdown.

But in a 1995 memo to all nuclear plant operators, the NRC said that one more thing might have gone wrong. The NRC warned other utilities that Northeast had discovered a potential flaw in its containment sump recirculation valves. The valves in the system that would have kicked in to circulate water through an exposed reactor core to prevent a melt-down if the leaking valve in August 1993 had burst. The valves in the backup system might have locked tight if the valve was exposed to the extremely hot water coming out of the reactor. In other words, there was a chance that the back-up system might have failed as well.

The fact that the NRC refuses to put two and two together and publicly state the risks is frustrating, says Paul Blanch, a former Northeast Utilities supervisor, who like Galatis challenged NU only to be rebuffed by management back in 1989. "Had an accident occurred, the (back-up) valves would have failed and the core would have been uncovered," he says, leading to a meltdown of the core. Since no cooling water would pour down on the core, the meltdown would have breached the containment, he says.

Blanch says the Inspector General's office, an independent agency which faulted the NRC for not performing its duties in a report on May 31, is

investigating the back-up valve issue. But again, NRC regulators appear to have been lax in dealing with this issue. The agency waited a full month from the time Northeast reported the pressure locking problem before passing the information on to other plant operators. The NRC letter, like almost all NRC notices, did not force anyone to take corrective action and contained no details about the consequences of the back-up system's failure.

"Apparently, the only time the NRC will take any action to assure public safety is after an accident that causes a major loss of life or property damage," says Blanch.

Based on his own uphill battle with the NRC, Galatis believes that the regulators and Northeast Utilities have been involved in a criminal conspiracy. "There's something unholy going on between NU and the NRC," he says. For a man who says he may enter divinity school once this controversy has passed, that is a strong accusation. So far, no investigative agencies have agreed. But the federal government's General Accounting Office is reportedly in the early stages of a probe into the regulators' role at Millstone.

Still, even the NRC has admitted that it was not firm enough in its role as regulator. The persistent problems with procedural compliance and whistle-blower complaints at Northeast have led the NRC to demand that all three plants perform massive re-engineering studies while they are shut down to make all its procedures match its practices. In short, Northeast is now doing what Galatis called for four years ago when he first started to uncover problems at Millstone 1. Essentially, the NRC has vindicated his analysis.

The turnabout is part of an unprecedented shake-up at the NRC. Whistle-blower Blanch, who talks regularly with officials at the NRC, recently met with NRC Chairwoman Shirley Jackson, a physics professor at Rutgers University who was appointed to the job last year, and says he has some hope that the system will get better. "She's a good person," he says. "She's bright, and I think she wants to do the right thing." Indeed, Jackson has ordered a task force to investigate the NRC's role at Maine Yankee, another troubled New England nuclear plant. The task force will report directly to her, Blanch says, a move unprecedented since the partial meltdown of Three Mile Island in 1979. Still, based on his seven years of experience with the agency, he is taking a wait-and-see attitude.

"I always thought the NRC was a tough regulator," Blanch says. "They will require you to dot every 'i' and cross every 't' just to provide what I call an illusion of action. But when it costs money, they put their head in the sand. There are hundreds of issues that have a significant impact on safety that they do nothing about."

Once again, it returns to the sensitivity of economics. If oil costs were higher, the efficiency of nuclear power might make it more viable. But right now, nuclear fuel in many markets is struggling to stay competitive with plants that run on fossil fuels. Blanch and Galatis both believe that there is a future for nuclear power. Blanch says he even wants to work with the NRC to make sure that it is a safe one. "I'm not opposed to nuclear power," says Blanch. "I'm opposed to the sloppy regulations and the risks that are being taken."

One of the most fundamental risks is contained in that deep blue spent-fuel pool. For years, the federal government has promised to build a long-term storage facility for old nuclear fuel. But no state wanted to be the site of such a potentially dangerous facility. The U.S. Department of Energy has announced that a permanent site at Yucca Mountain, Nevada will not be ready

until 2010, if at all.

So, the radioactive bundles of nuclear fuel have been piling up in spent-fuel pools across the country. It might be a slight understatement to say that this makes the consequences of a spent-fuel pool accident more severe. In effect, the equivalent of six or seven cores of nuclear fuel could melt down, outside the containment of the nuclear core. Blanch says he thinks the consequences of such an accident however unlikely would be the permanent evacuation of a 50-mile radius from the plant. But the NRC won't give him an analysis of the consequences.

An interim solution would be if the NRC were to demand that the utilities store their radioactive old fuel through a process called "dry cask" storage. The process would put the rods in airtight concrete containment, but it is expensive. A cask recently caught fire while it was being welded shut at the Point Beach power plant in Wisconsin, leading Castagno to point out that that process may also have its risks. But then, so does leaving the fuel in the spent-fuel pools.

In response to heated criticism of its handling at the Millstone plants, the NRC has gotten tough. "We've embarrassed our regulator," concedes Castagno. "They're going to make sure that doesn't happen again." To that end, the NRC has taken a pointed approach to Millstone. The site now has a team of 10 inspectors, up from four last year. The team has been pulled out of the NRC's traditional chain of command, creating a Millstone Oversight Team which reports directly to the NRC's regional administrator. The team so far has taken a hard line with Millstone.

The changes did not stop there. As of August 4, the new team will be reporting to a new boss. Region One Administrator Thomas T. Martin is headed to a desk job at the NRC's central office in Virginia to handle policy matters. The new administrator will be former Region Three head Hubert Miller, who the NRC is hoping will bring a fresh eye to Region One's problems. The NRC is also doing a top-to-bottom review of its regulatory guidelines at the prompting of Chairwoman Jackson.

In the wake of the May 31 Inspector General's report that the NRC should have placed Millstone on the agency's "problem plant" list, a group is also drawing up a checklist to clarify what constitutes a troubled plant. As far as more widespread reform of the process, officials say no specific plans are in the works yet. "I would describe it as sharpening the way we do business," says Region 1 spokeswoman Diane Screnci.

Nonetheless, Screnci adds, there is a sense internally that the NRC needs to polish its tarnished reputation. "I think that's a problem that [Chairwoman Jackson] is trying to solve," Screnci says. "How we not only convince everybody that we're doing a better job, but actually do a better job."

Northeast, too, is making changes, though they are greeted with skepticism by Galatis and his fellow whistle-blowers. Last week NU unveiled a new framework for operating the nuclear power plants. But when Galatis leafed through the palm-sized eight-page pamphlet, he scoffed at it. "It's the same old thing," he says.

Chairwoman Jackson seems intent on making sure that the agency learns its lesson from the Millstone experience. "I think there is a special sensitivity on the part of the public where the issue involves nuclear energy," she told an industry group in Washington several weeks ago. "What this means to me in terms of public acceptance, is that neither the nuclear industry nor the NRC cannot afford to tolerate anything short of excellence."

While she does not say as much in her public speeches, Jackson's

self-described "strategic assessment and re-baselining effort" may add up to substantial reforms designed to reestablish shaken confidence in the industry because of the Millstone controversy. "When problems do arise," Jackson told the group, "I think it is important that we look not only at correcting the specific situation, but also ask ourselves whether there are underlying deficiencies which allowed the situation to occur." That suggests that there may be some changes in store for the nuclear power industry in coming months that go beyond the troubles at Millstone.