

Radioactive leaks increasing at U.S. nuclear plants

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NRC Chairman Gregory B. Jaczko: Tritium leaks are "not an acceptable situation for any power reactor in the United States." / AP PHOTO



The NRC is acting as if they're not going to do anything until someone dies and then they'll perhaps take those regulations (against leaks) seriously," said David Lochbaum, Union of Concerned Scientists. / ASBURY PARK PRESS FILE PHOTO

ZOOM



ZOOM

Monitoring well with tritium contamination at Oyster Creek Nuclear Power Plant in Lacey Township owned by Exelon Corp. / Peter Ackerman / APP

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Millions of gallons of radioactive water have leaked from nuclear power plants throughout the U.S. since the 1970s, threatening water supplies in New Jersey and other states, an Asbury Park Press investigation found.

Despite massive leaks that pollute groundwater, the U.S. Nuclear Regulatory Commission has never fined a violator - even plant operators that repeatedly leaked tritium, a radioactive form of hydrogen and a common byproduct of nuclear fission that can cause cancer.

Major leaks at plants have increased in recent years. There was an average of one per year in the 1990s. There were five leaks or spills reported in 2010, five in 2009 and three in 2008, according to an NRC document.

"A leak in and of itself is generally not considered a violation," an NRC spokesman, Neil A. Sheehan, said in an email last week. The NRC's mission is to ensure the public faces "no undue risk," he said. Tritium leaks do not pose that risk level, he said.

NRC Chairman Gregory B. Jaczko, though, told U.S. senators last month that tritium leaks are "not an acceptable situation for any power reactor in the United States."

Yet the NRC, which urged the industry in 1979 to focus on preventing radioactive leaks, spills and overflows, has seen major unplanned discharges increase in recent years as nuclear plants age and their underground pipes deteriorate.

NRC and industry officials say the leaks have posed little or no risk to drinking water wells or the public health because contaminated groundwater has almost always remained under the power plant sites.

Critics say that is not the point. Just as it is illegal for other companies to spill toxic waste onto the soil, nuclear plants should not get a pass when it comes to polluting groundwater with radiation. The critics say the NRC's lax oversight has allowed the radioactive leaks to go on for decades - with little regard for the public's health.

"The NRC is acting as if they're not going to do anything until someone dies and then they'll perhaps take those regulations (against leaks) seriously," said David Lochbaum, director of the Nuclear Safety Project at the Union of Concerned Scientists, a nonprofit alliance of scientists and citizens based in Cambridge, Mass. "It's too high a price."

NRC officials defended their efforts on the tritium issue.

"Nuclear power plants have an active program to eliminate or reduce tritium leaks, and existing leaks have not resulted in any adverse health effects or impact to public health and safety," Sheehan said in an email.

After hundreds of leaks and spills over the decades, the oversight agency is considering changing its regulations to address groundwater contamination problems, including maintenance of piping systems, he said.

New Jersey leads the nation in the intensity of radioactive water leaked or spilled by nuclear power plants, the Press found in its review of NRC data. The Salem and Oyster Creek plants have leaked tritium with radiation that is more than 500 times the legal limit for drinking water.

The U.S. Environmental Protection Agency's limit is 20,000 picocuries (a measure of radioactivity) of tritium per liter of water. Its goal, however, is zero picocuries because tritium is a cancer-causing agent.

Drinking water with 20,000 picocuries could lead to about one cancer for every 25,000 people over a lifetime, according to the EPA. In a population of 1 million, that would be about 40 new cancer cases. But some states and countries have set or recommended much lower limits because of concern about tritium's health effects.

Recent scientific studies say its cancer risk could be two to three times higher than what the EPA claims.

"There is this apparent unwillingness on the part of the NRC to enforce its own regulations and, unfortunately, protection of groundwater is not the only area of public health and safety that this occurs," said Paul Gunter, director of the Reactor Oversight Project at Beyond Nuclear in Takoma Park, Md. "This stuff is out there. It is not supposed to be there."

Concern over nuclear power plants and radioactive contamination, no matter how slight, has grown in the weeks since high levels of radiation were released at the crippled Fukushima Dai-ichi nuclear complex in Japan following a devastating March 11 earthquake and tsunami.

In the U.S., hundreds of thousands of people swim, drink or fish in areas with water contaminated by routine releases of tritium.

Most of the time, the public doesn't know that tritium could be in their drinking water. About 200 out of 47,000 public water utilities test for tritium, according to one environmental group's survey of water quality. Tritium testing may be done when there is a known radiation source nearby.

Once contaminated, tritium cannot be removed from water and "you need to do everything you can to make sure that (it) doesn't take place," said Bill Buscher, manager of the Hydrogeology and Compliance Unit in the Groundwater Section of the Illinois Environmental Protection Agency.

Findings

In a nearly year-long investigation, the Press found that:

-- Nearly all nuclear plants have leaked tritium. There are 65 nuclear power sites in the U.S., with a total of 104 reactors, and essentially all have had some type of leak or spill of radioactive material. Of those, 37 had major tritium discharges above the legal limit since the 1970s. Many leaks were due to deteriorating underground pipes and lax inspections, according to NRC and industry documents. States most affected include New Jersey and Illinois.

-- The current EPA limit for tritium in drinking water may be too weak. California set a goal of 400 picocuries per liter five years ago - 50 times lower than the EPA limit.

-- Fifty-six water authorities that serve about 24 million people had tritium in their tap water at least once from 2004 to 2009, according to the Environmental Working Group, a Washington-based environmental association.

But the tritium sources are unknown. Besides unplanned spills, nuclear plants are legally allowed to discharge tritium into waterways and the air. Other sources can range from nuclear weapons plants to research reactors to discarded exit signs.

-- Most nuclear plants have had more than one tritium leak. More than 20 "significant underground pipe leaks" have been documented at Oyster Creek since 1980, according to plant owner Exelon Corp. In 1996, the plant accidentally discharged 133,000 gallons of radioactive water with tritium into its cooling canal, which flows into Barnegat Bay, according to the NRC.

-- Big leaks have been increasing. From 2003 through 2010, two to five plants a year had unplanned releases of tritium higher than the EPA's legal limit, according to an NRC document. U.S. nuclear reactors are 31 years old, on average, and the NRC has relicensed most plants for 20 additional years. Some plants could run until the late 2040s.

The Nuclear Energy Institute, an industry policy group, said the public should not be alarmed by tritium.

"We and NRC have emphatically shared the conclusion none of these (leaks has) posed significant risk to public health or safety," said Ralph Andersen, senior director of radiation safety and environmental protection at NEI. "It's really the issue of the leaks rather than the issue of what's in the leaks."

Routine discharges into drinking water

One city keeps an eye on its neighboring nuclear power plant. It has to. Tritium is in its drinking water.

The city of Wilmington, Ill., regularly tests for the isotope because of Exelon's Braidwood nuclear power plant in Braceville.

The plant routinely and legally discharges tritium into the Kankakee River, the source of drinking water for 6,200 Wilmington residents. The plant is about 6 miles upstream of the city's water intake, according to an Illinois government report.

From 2004 to 2009, Wilmington had up to 11,800 picocuries of tritium per liter in its water supply, according to the nonprofit Environmental Working Group.

That's more than half the federal limit of 20,000 picocuries. The average tritium level reported was 382 picocuries per liter, according to the environmental group. Such low levels are safe to drink, according to the EPA.

Jacque Plese, superintendent of Wilmington's water department, said Exelon agreed to release tritium into the river at night, when Wilmington is not running its water treatment plant. Exelon and the city are supposed to let each other know when they need to change their operations, he said.

"I drink the water that we produce, and I have no problems with that," he said. "I'm very, very confident in our water supply right now."

In New Jersey, data on tritium levels in public water systems are not collected, according to Larry Ragonese, a spokesman for the state Department of Environmental Protection.

"It would not be a substance that would normally have any likelihood of showing up in public water," he said in an email.

How dangerous is tritium?

Tritium ranks relatively low on the scale of dangerous radioactive materials.

If used fuel rods from a reactor are at the top of the scale in terms of lethal radiation, tritium would be close to the bottom.

Yet even small doses of tritium and other types of radiation could increase the risk of cancer, according to a 2006 National Academy of Sciences panel.

The radioactive intensity of tritium depends on its concentration in water. Once created, it takes 12.3 years for tritium to lose half its radioactivity. Tritium is most harmful when ingested through drink or food, according to scientists.

It is considered dangerous for at least 120 years, according to the Nuclear Information and Resource Service, an anti-nuclear group based in Takoma Park, Md.

Mary Nguyen Bright, a spokeswoman for the South Carolina Department of Health and Environmental Control in Columbia, S.C., who has dealt with tritium discharges, said, "If you have a (radioactive) leak, tritium will get there first. It's like a racehorse." It moves quickly once it gets into groundwater, she said.

New Jersey has had the two highest tritium levels in leaks and spills in the nation, according to the NRC.

The Salem nuclear complex in Salem County ranks first because a leak discovered in 2002 had radiation that was 750 times higher than what is permitted in drinking water. Oyster Creek in Lacey ranks second at 540 times above the limit. Both sites are working on cleaning up the spills.

Debate over the risks

Arjun Makhijani, president of the Institute for Energy and Environmental Research (IEER) in Takoma Park, Md., a nonprofit that studies energy and environmental issues, said manmade tritium is the most pervasive radioactive pollutant.

"We ought to pay more attention to the various effects of tritium, not just the cancer effects," he said.

Other effects may include miscarriages, according to Makhijani.

Last year, the EPA said that it began reassessing the health risks of beta particles, including their possible effects on human development and reproduction.

Tritium and some other radionuclides emit beta particles - subatomic particles ejected from the nucleus of some radioactive atoms, much like a tennis player hitting a ball out of the court. Beta particles can damage cells, especially if a radioactive material is swallowed or inhaled.

Exposure to 500 picocuries of tritium per liter could cause about one cancer in 1 million over a lifetime, according to an EPA spokeswoman. Stuart Walker, a leading EPA Superfund staffer, though, said his calculations show 160 picocuries per liter would be a one in 1 million cancer risk over 30 years of exposure.

And not all agree that the EPA's 20,000 picocurie limit is safe enough.

California has established a public health goal of 400 picocuries for tritium in drinking water, while an Ontario advisory council has recommended a limit of 541. Colorado set a limit of 500 picocuries in some waterways near a closed federal nuclear weapons facility.

Tritium's cancer risk appears to be two to three times higher than the EPA views it, said David C. Kocher, senior scientist at the SENES Oak Ridge Inc. Center for Risk Analysis in Oak Ridge, Tenn.

An updated cancer risk estimate for tritium likely wouldn't have much impact on releases from nuclear power plants, said Kocher, a tritium risk expert.

But it's conceivable that EPA officials would think they need to reconsider their drinking water standard for tritium, he said.

EPA officials declined to comment on the issue.

6.2 million gallon leak

Buscher, of the Illinois Environmental Protection Agency, said the NRC needs to consider the protection of groundwater.

He oversees efforts to deal with tritium contamination discovered several years ago near Exelon's Braidwood plant.

The plant leaked about 6.2 million gallons of tritium-contaminated water - enough to fill more than 300 backyard swimming pools. Plant officials failed to adequately respond to leaks in 1996, 1998 and 2000, allowing the contamination to spread off-site. Tritium was detected in one private well, according to documents.

Exelon agreed to pay \$1.2 million to settle three Illinois lawsuits regarding tritium leaks at the Braidwood, Byron and Dresden nuclear plants in the state.

Since 2006, both industry and the NRC have launched initiatives aimed at dealing with the leak issue.

According to NRC spokesman Sheehan, a typical nuclear power plant site has an estimated 0.8 to 2 miles of buried and underground pipe that carries radioactive liquids.

Gunter, of Beyond Nuclear, said "because these systems are by and large buried and inaccessible, they're not being maintained. They're not being inspected and they are not contained when they eventually break, of course."

Oyster Creek had 720 feet of underground piping with radioactive liquids, according to Sheehan.

Exelon spent more than \$13 million to put the piping above ground or in trenches that are monitored, according to Exelon spokeswoman April Schilpp and Sheehan.

The DEP's Mulligan said he thinks the NRC does an excellent job reviewing piping that is linked to plant safety, such as reactor cooling systems.

But the NRC should inspect other pipes, especially those with tritium, he said.

In 2006, the nuclear industry launched a voluntary Ground Water Protection Initiative. Three years later, it launched a Buried Piping Integrity Initiative that was expanded to include underground piping and tanks.

Andersen, of the Nuclear Energy Institute, said tritium leaks detected since 2005 led to far-reaching and cooperative efforts to deal with the issue.

Sheehan said the NRC will have to decide whether its current rules are good enough to address the radioactive leaks and groundwater pollution issue.

Delayed cleanup for many plants

The NRC's mission focuses on nuclear safety, and to a lesser degree environmental protection, according to officials.

NRC regulations recognize that unplanned releases will happen, said Steve Garry, senior health physicist in the NRC Office of Nuclear Reactor Regulation.

But plants still have to meet safety standards, he said.

Pam Henderson, chief of Plant Support Branch 2 in the NRC Division of Reactor Safety, said "of course, we don't want to see any groundwater pollution. Our regulations talk about keeping any of these releases as low as reasonably achievable."

Some plants will spend years cleaning up their contamination, but a cleanup can begin years or decades after a discharge is first detected.

The NRC does not require plants to clean up their sites until decommissioning - which for some may not be for nearly 40 years. Garry said the NRC staff is drafting a potential early cleanup rule.

Lochbaum, of the Union of Concerned Scientists, said the NRC simply has to enforce the rules on its books.

"Nuclear safety is not a spectator sport," he said. "The NRC is not there to watch. They're there to enforce the regulations."

"I'm hoping we're gonna have this behind us at some point," he said. "It seems to hang around as long as the tritium half-life. I think we'll get there. It will just take some time."

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