

Duke steps up monitoring of tritium

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SALEM — Operators of the Oconee Nuclear Station know a radioactive substance has seeped into the groundwater within the facility's boundaries nine miles north of Seneca.

They also know the substance — a byproduct of nuclear reactor operations called tritium — hasn't increased since it was first detected in a monitoring well last year. It also hasn't moved. This means any leaks that got the tritium there are not new and the likelihood of it getting near drinking water sources such as Lake Keowee are minimal.

Since 2006, plant owner Duke Energy has nearly tripled the number of groundwater monitoring wells it uses to detect tritium in the environment. The concentration considered unsafe for human consumption is 20,000 picocuries per liter.

In 2010, two wells at Oconee detected groundwater contamination that exceeded this level. One well measured a concentration of 32,700 picocuries in July 2010, but it has since turned up no detectable contamination.

The second well, which measured 35,400 picocuries in January 2010, remains contaminated, and operators still aren't sure where the tritium came from. Over the past year, the company drilled an additional 12 wells, most of them around the problem site, and those so far have come up clean.

Clemson nuclear engineering professor Timothy DeVol specializes on the safety hazards to people exposed to radioactive contaminants.

"They don't know how the tritium is getting in there," DeVol said. "Was it an accidental spill? Was it a broken pipe? That's what's concerning. They don't know where it's coming from."

Still, he said, Duke's environmental record at Oconee has been good and has improved over the years.

"My students had an experiment where we would look for cesium in the lake sediment," DeVol said. "Oconee ruined that for us. They are cleaning up their waters and aren't releasing it. Now we have to dig a two or three-foot core to get to it. I tell them I'm really disappointed I have to work harder to find the effluent."

Oconee is not alone in detecting tritium leaks. The federal agency that oversees the industry, the Nuclear Regulatory Commission, has set up a section on its website devoted to damaged pipes and tritium leaks. Of the 38 known leaks since 1979, 22 have taken place at aging plants since 2006.

The Oconee Nuclear Station was designed in the 1960s and built in the 1970s.

Andy Sabisch is the senior resident inspector at Oconee Nuclear Station for the Nuclear Regulatory Commission.

"Not to say the designs were flawed, but there was limited consideration given to whether pipes were to last 60 years underground," Sabisch said.

He said one length of pipe that served Oconee's Standby Shutdown Facility with cooling water from Lake Keowee failed in early 2010

"The leak itself was fairly small but the analysis showed considerable degradation in the area of the leak; i.e., thinning in the surrounding wall," Sabisch wrote in an email to Richard Conte, a branch chief for the NRC in April 2010.

Sabisch told the Independent-Mail the ground above the pipe grew damp from lake water leaking out, but it was never "spewing geysers" and wasn't radioactive.

"It was a carbon steel pipe, and they have replaced it with stainless steel," Sabisch said. "It was a safety-related system, but it was a backup to a backup system. It never impacted the ability to feed the generators. It was found and corrected well in advance of any significant degradation occurring."

Typically, he said, pipes grow weakest where they bend, and the industry is developing better ways to detect problems. Robotic cameras offer visual inspections, and ultrasonic testing devices measure pipe thicknesses. Pressure tests also alert operators to leaks.

The most serious tritium leak, the only one known to have leaked outside of a nuclear plant's grounds, occurred around 1998 at the Braidwood plant in Illinois. That incident became public in 2005.

Sabisch said Braidwood had a line that went from the plant underground to the river to release trace amounts of radioactive water in the stream.

Oconee does the same thing with some of its tritium-laced water — releasing it into the Savannah River Basin — but in quantities safe for human consumption and heavily regulated by state and federal environmental agencies, Sabisch said.

"Braidwood had this mile-long length of pipe that stretched across their property into farmland and into a river," Sabisch said. "The pipe leaked into a field and raised the issue."

Duke spokeswoman Sandra Magee said no people have been exposed to the concentrated groundwater tritium at Oconee and the plant has never recorded elevated levels of tritium leaking off its grounds.

"For this particular well we are talking about, with the elevated reading, you'd have to drink two liters of this water every day for a year," Magee said. "That would be equal to a radiology dose of 8 millirems. A chest X-ray is six to 10 millirems."

Sabisch said Duke has been pumping out the tritium-laced water from the groundwater pocket.

"As they are pumping it, the count rate has dropped," Sabisch said. "This is not indicative of a current issue."

Most likely, Sabisch said, a drainage system inside the plant caught some irradiated water that leaked or splashed out years ago and carried it to one of three unlined treatment ponds on the site. Such ponds are now lined — a requirement that did not exist in the early 1970s.

"You are paying for the sins of the past," Sabisch said. "This probably happened 20 or 30 years ago."

Sabisch said the commercial nuclear industry's information sharing on problems since 1979 and operators' increased knowledge about the natural wear and tear of plant components have made nuclear power production safer and more efficient.

The Institute of Nuclear Power Operations was formed in 1979 for this purpose in reaction to the meltdown at Three Mile Island earlier that year. Utility owners actively share information about operations and safety problems with each other.

"It is unique," Sabisch said. "I can't imagine Delta sharing maintenance issues with Southwest."

Sabisch was working for General Public Utilities in 1979 the day a valve stuck open at Unit 2 of the Three Mile Island plant and caused a meltdown. He said he met a man who retired from Duke Energy two years ago who had a similar valve get stuck at a Duke facility the year before Three Mile Island. That man figured out the problem, got the valve closed, and the plant stabilized.

"If the industry had the ability to communicate with other units at the time, Three Mile Island would have known," Sabisch said. "It could have saved a \$1 billion plant."



