

# Chicagoland

Chicago Tribune  
PAGES 6-13

## Nuclear waste generating new fears

Japan crisis stirs safety issues over spent fuel storage

By Julie Wernau and Lisa Black  
TRIBUNE REPORTERS

Fourteen years ago, Zion nuclear power plant's last red-hot fuel rod was lifted from its reactor core and submerged into a pool of water, joining the rest of the plant's 2.2 million pounds of spent fuel. The nuclear waste was supposed to be entombed deep within Nevada's Yucca Mountain.

But the U.S. Energy Department scrapped that plan last year. That left operators of Zion and more than 100 nuclear reactors in the U.S. with the responsibility for storing on site the dangerous spent fuel.

Chicago-based Exelon Corp. shuttered Zion in 1998 and another company is dismantling the complex piece by piece. The plan calls for Zion's waste to be encased in concrete-and-steel bunkers not far from Lake Michigan, possibly in perpetuity.

In the wake of Japan's disaster, the safety calculation involved in storing such waste has changed, experts say. More than 80 percent of the spent nuclear fuel in Illinois remains in pools.

In Japan, no one considered the possibility of a 9.0 earthquake and a devastating tsunami.

Fuel rods at the crippled reactors have been exposed to air. They are heating up and emitting high levels of radiation, making it difficult for workers to get close enough to cool them. The lesson, experts say, is that nuclear safety seems more designed for most-likely scenarios, not worst-case scenarios.

"This is a once-in-a-millennium event — but we don't plan for those," Kenneth Benedict, executive director and publisher of the Bulletin of the Atomic Scientists said Friday.

In Zion, a town of 25,000 about 50 miles north of Chicago, and at other towns where nuclear waste is stored, Japan's crisis has some questioning if the most unlikely events could happen and whether they would be protected.

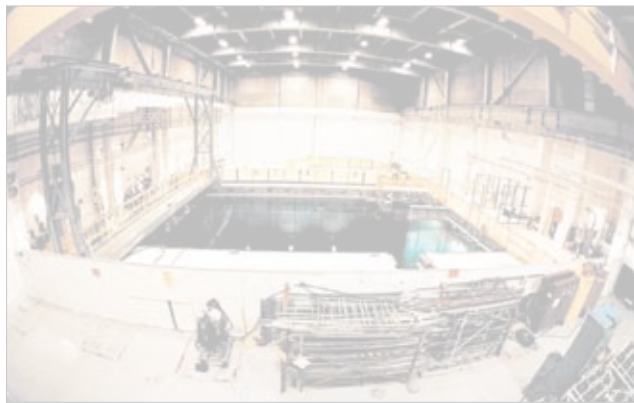
In Illinois, 28,588 fuel assemblies, each containing a bundle of 200 rods and weighing about 600 pounds, are cooling in pools on the ground or above reactors as in Japan.

They are "very inviting targets for terrorists," said David Lochbaum, director of the Nuclear Safety Project of the Union of Concerned Scientists, and critics note that the buildings that house the pools are flimsy.

"No one has come up with a solution to safely store this waste for 10,000 years into the future," said Lochbaum.

The Energy Department says it is committed to ensuring it meets its long-term disposal obligations, but a plan hasn't been disclosed.

For safety reasons, law requires



Spent nuclear fuel rods are stored in a pool at Exelon's Zion complex. The rods will eventually be put into dry bunkers not far from Lake Michigan, raising concerns from some experts and nearby residents.

spent rods to cool in pools for five years before they can be moved into dry casks — stainless-steel canisters, encased in 3-inch-thick carbon-steel liners and covered in 2 feet of reinforced concrete.

Installing dry-cask storage infrastructure at a plant with two reactors would cost between \$20 million and \$30 million, and annual costs for buying casks, loading them and running a dry-cask storage facility are \$7 million to \$10 million, according to Exelon.

Unlike in Japan, Zion's fuel rods have been cooling for as long as 40 years.

"You can't have a meltdown,"

said Patrick Daly, general manager of EnergySolutions, which is dismantling Zion.

By 2020, EnergySolutions expects to turn the 240-acre site into an uncontaminated field of grass. Unless the federal government comes up with an alternative, 10 to 15 acres of the land will be home to 61 concrete and steel dry casks, each weighing 125 tons, used to store spent fuel.

At a panel discussion Friday focused on Japan's crisis and hosted by the Chicago Council on Global Affairs, Robert Gallucci, president of the John D. and Catherine T. MacArthur Foundation, said the concrete monoliths were "a good interim solution" to the storage problem. He said he was a "very enthusiastic supporter of long-term dry storage." Gallucci previously served with the

U.S. State Department as a special envoy focused on the threat posed by the proliferation of weapons of mass destruction.

Even Lochbaum calls dry-cask storage "the cheapest insurance we can possibly pay."

So far, none of Zion's waste has been moved into dry casks. This summer a pad is to be built about 2,000 feet from Lake Michigan that would protect the casks from earthquakes.

Daly said spent fuel will be moved into dry casks by 2014. Meanwhile, cooling occurs through natural convection.

The casks are designed to withstand tornadoes and earthquakes, and are nearly impossible to steal, Daly said.

Even if a cask was cracked, hazardous levels of radiation would be contained to the area around the cask because of the age of the fuel rods, he said.

Still, some who live near Zion are concerned about permanent storage of radioactive material in the area.

Roger Whitmore, owner of a Zion automotive store and past president of the Zion Chamber of Commerce said, "If we had a big earthquake or seiche," referring to a large wave from Lake Michigan, "what's (the waste) going to do, sweep into the lake?"

That's unlikely, said Michael Chrzastowski, senior coastal geologist at the Illinois State Geological Survey.

Zion is built about 9 feet above the water level of Lake Michigan. The largest seiche — a wave caused by air pressure and wind — to hit Lake Michigan was 10 feet, he said.

In such a case, he said, the area would only experience "nuisance"-level flooding.

Moreover, the lake side of the storage area is protected by a wall of boulders, he said.

Of more concern, he said, is an area about 2 miles north of the Zion plant, where erosion washes away the shoreline by as much as 10 feet per year.

"Shore erosion needs to be continually monitored along the state park shore and near the power plant," he said.

Daly said they are not monitoring the erosion, but if it became a problem, the company would take care of it.

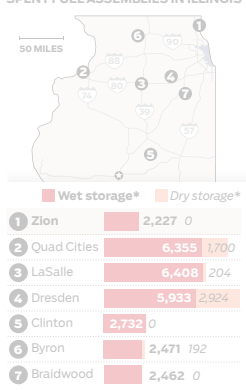
Tribune reporters Michael Hawthorne and Ameet Sachdev contributed.

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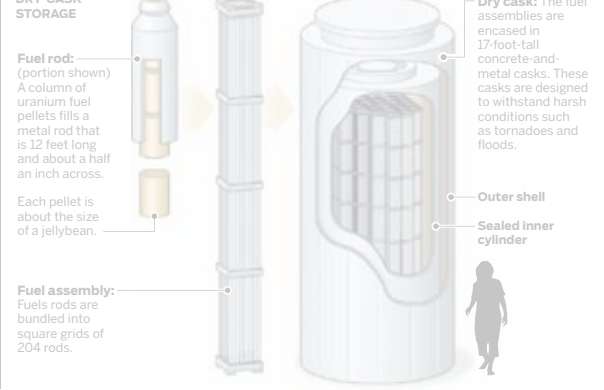
### Dry cask storage

When nuclear fuel is spent, or no longer useful to generate electricity, it is placed in pools of water and boric acid for at least five years, until it is cool enough to be moved into long-term storage. Critics have questioned the safety of such pools, which are prevalent in Illinois and elsewhere, and want to see more of that fuel moved into bunkerlike dry casks, which they say is a safer solution.

#### SPENT FUEL ASSEMBLIES IN ILLINOIS



#### DRY-CASK STORAGE



## Word by word, language is stolen

The day David Foote had to admit that words were leaving him, he was standing at a blackboard at Lake Forest High School, lecturing on "Romeo and Juliet." Mercutio. Montague. Lady Capulet.

He knew the characters as well as he knew his bow ties, but now, poised to explain the play to a room full of teenagers, every one of those Shakespearean names escaped him.

His wife had already noticed changes in his speech. He'd started scrambling pronouns. "I" exited his mouth as "they." Nouns vanished.

His wife knew it was odd that he had anything less than perfect control of his basic tools. An English teacher who confuses words is like a carpenter who mixes up nails and screws.

"I'm fine," he'd say when she'd bring it up. "I'm fine."

That day at the blackboard he had to admit he wasn't.

■■■■  
Foote was only 58 when he discovered he had a little-known form of dementia known as primary progressive aphasia, PPA, for short.

Alzheimer's, the dementia we all know, steals memory. PPA begins by destroying nerve cells in a part of the brain that controls language. In other words, it steals words.

"I can find the real world," Foote said Friday. He paused, revised. "Word. I can find words, but sometimes through circuitous routes."

He was sitting in his Wilmette



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living room with his wife, Cathy Donnelly. They agreed to be interviewed because a big conference on PPA is coming to Chicago this week, and though they haven't discussed his condition even with some of their friends, they believe it's important to help others understand the disease.

"It's my coming out, I guess," Foote said.

Now 66, Foote still looks like a parent's reassuring dream of an English teacher. His full grey hair is as neat as his sweater vest. His smile and gentlemanly humor are intact.

But listen. He says "toy" when he means "treat." "Prominent" when he means "permanent." Sometimes he's as articulate as you'd expect of a man who taught English for 22 years at Evanston Township High School and another 15 at Lake Forest. Other times, he's lost in a verbal maze.

"My life has been talking," he said. "And teaching. And helping kids learn to write. And telling stories. I felt there was. I knew. I felt. I guess."

You could almost hear his mind. Scanning. Searching. Shuffling. Waiting. Finally the words: "I felt parts of me were falling off."

Reading is one part that has fallen off. If he reads now, he has to do it out loud.

And spelling. "Come on, I can do this," he told himself when letters started going haywire. But he couldn't.

And numbers.

"Here's my watch." He held up a wrist and on it, a watch made for the blind. He punched a button on the side. The watch announced: "The time is 11:32 a.m."

A few minutes later, his wife asked if he could read the hour. He gazed at the round dial.

"It's 10. No. It's 11." He looked up. "I don't know."

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Because PPA creeps into a mind earlier than most dementias, it often goes unrecognized. Foote was lucky enough to find his way to Northwestern's Cognitive Neurology and Alzheimer's Disease Center, the sponsor of the upcoming conference, where he was diagnosed.

At Northwestern, he learned the bad news: There is no cure. Unlike stroke victims, people with PPA can't recover speech through therapy. Eventually, memory goes too.

At the same time, he learned that people with PPA often devel-



David Foote and his wife, Cathy Donnelly, at their home in Wilmette.

op skills that don't demand much talk. Some garden. Or build things. He has taken up watercolors. He also hangs on to his job as a docent at the Loyola University Museum of Art.

Some days he goes to a support group at Northwestern. It's a place where people who have trouble talking feel safe talking to each other. "I used to be able to," he said. "To. Be. able. Help."

"Help other people," Cathy said.

She finishes a lot of his sentences. She pays the bills now too. The numbers were too much for him. But he cleans and cooks, and if his trouble with measurements results in some strange dishes, she doesn't mind.

"For a while there," he said, "I was, I was driving in the evening and there was a little..."

He waved his hands, smiled, let the unspoken words drift off.

To prepare for our interview, Foote scribbled two lines of a Dylan Thomas poem on a small yellow sheet of paper. He picked it up to read.

"Do not go gentle," he said. Paused. "Do not go gentle." Pause. "Into there."

The lines as he had written them were this:

*Do not go gentle into that good night,  
Rage, rage against the dying of the light.*

"Fight it," he said. "Fight it. I'm not fighting it to be angry. I keep raging to make sure I can keep doing things."

Cathy reached out, clasped his wrist, blinked back tears.

"He's the most upbeat, enthusiastic, joyful man," she said. "But there's going to come a time."

Her words, too, drifted into silence.

# Word by word, language is stolen

BY MARY SCHMICH

Sunday, March 20, 2011

The day David Foote had to admit that words were leaving him, he was standing at a blackboard at Lake Forest High School, lecturing on “Romeo and Juliet.”

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SHAUN SARTIN/PHOTO FOR THE TRIBUNE

Caption: Photo: David Foote and his wife, Cathy Donnelly, at their home in Wilmette.

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