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Nuclear fuel rods' location elusive

This story was published 7/11/2001

By John Stang
Herald staff writer

Two lost Connecticut nuclear fuel rods could be buried at US Ecology's low-level radioactive waste site at Hanford.

Or maybe they're stashed away at a similar site in South Carolina.

A lab near San Francisco is a possibility.

Heck, the two rods could still be hidden in the giant pool of water in Connecticut where they were last confirmed seen about 21 years ago.

Right now, no one knows.

"They're just as likely not to be here, as they could be here," said Jeffrey Merrifield, a commissioner on the Nuclear Regulatory Commission Tuesday in Richland.

These two rods -- thin zirconium and aluminum alloy cylinders 13 feet long, a 12-inch thick and filled with depleted uranium pellets -- are the only fuel rods that have been totally lost in American nuclear history, according to the Hartford Courant newspaper in Connecticut. The only other American case of lost nuclear fuel involved a piece smaller than a rod.

If the rods show up at US Ecology's site, the risk

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to people is almost nonexistent, NRC officials said. "As an immediate health and safety concern, that is not the issue," Merrifield said.

The rods hold about 300 curies of radiation, which are masked among the at least 3 million curies radiating from material already buried at US Ecology's site, he said. However, the highly radioactive fuel takes much longer to decay than low-level radioactive wastes.

It is premature to speculate on any potential health or environmental risks until it is confirmed the rods are buried at Hanford and their conditions are known, said John Erickson, director of the radiation protection division for Washington's Department of Health. The state health department is briefed weekly on the search for the rods.

"The utility (that lost the fuel) still believes the rods are in the spent fuel pool," Erickson said.

US Ecology officials could not be reached for comment Tuesday evening. US Ecology is a private company that leases some central Hanford land for a commercial low-level waste site.

According to NRC officials and the Hartford Courant, this is what happened:

The two rods come from Unit No. 1 at the three-reactor Millstone complex in Connecticut that Northeast Nuclear Energy Co. owned until four months ago. In 1972, operators bent the two rods during some repair work, making them useless in the reactor's core, where the fuel has tight tolerances to function properly.

So the rods were put in a long container, which was stored in the 45-foot-deep, water-filled spent fuel basin next to the reactor.

Then last December, Northeast Nuclear workers inventoried the fuel in the basin to prepare for selling the Millstone complex to Dominion Nuclear Connecticut for \$1.3 billion the following April. Workers could not find the two rods in the basin, and the latest paperwork confirming their presence is dated 1980.

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The Millstone spent fuel basin holds about 140,000 fuel rods. That basin also holds other equipment, containers and control rods -- much of which can be classified as low-level radioactive wastes.

Meanwhile, the NRC is keeping tabs on Northeast Nuclear's search with the utility expected to send a report on the matter to the federal agency in one or two months, Merrifield said.

Occasionally, Northeast Nuclear sent fuel rods to General Electric Co.'s Valecitos lab near San Francisco, which examines damaged fuel rods, Merrifield said. And the possibility exists that the container holding the two rods was mistaken for low-level radioactive wastes and removed from the basin.

So if the rods are not verified not to be in Millstone's basin, it is possible they might have been sent to the GE Valecitos lab, US Ecology's Hanford site or Chem-Nuclear's low-level radioactive waste site in Barnwell, S.C.

Although US Ecology's Hanford site can legally accept waste from only 11 Western states today, it was allowed to receive wastes from all over the nation in 1980, Merrifield said.

If the fuel rods went to Hanford or Barnwell, they would have been shipped in containers with enough shielding to protect people near them and to mask the highly radioactive fuel from the standard checks conducted at the two low-level waste sites, Merrifield said.

If it is verified that the rods went to Hanford, they would not be immediately dug up because of the risk to those excavating them, NRC and state officials said. Plus the rods likely would be buried deep, making exposure risk slight, they said.

If this scenario materializes, studies would be needed to determine the next move, Erickson said.

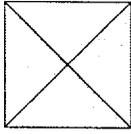
Meanwhile, the NRC would have to figure out the circumstances of how the fuel was lost before deciding if any fines or increased scrutiny are called for, NRC officials said

In 1999, Northeast Nuclear pleaded guilty in federal court to willful pollution and falsifying training records -- resulting in a \$10 million fine.

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Watchdog group has scenario for missing fuel rods

By [Paul Choiniere](#) - [More Articles](#)

Published on 5/30/2001

Waterford — The missing spent nuclear fuel rods at the closed Millstone 1 nuclear plant may have been mistaken for tubes used to monitor reactor activity, cut into pieces and shipped in a container to a low level radioactive waste dump, according to the Union of Concerned Scientists.

The organization monitors activity at the nation's nuclear plants and has been critical of Millstone Nuclear Power Station's failure to keep track of the fuel rods.

A spokeswoman for Northeast Utilities confirmed that the scenario described by the Union of Concerned Scientists is one of many that is being looked at as part of an internal investigation into the misplaced fuel rods. The spokeswoman, Deborah Beauchamp, said interviews with current and former Millstone 1 employees began nine days ago. She said it was far too soon to speculate about what happened to the fuel rods.

"The scenario outlined is no more or less likely than any of a number of scenarios that are being looked at," she said.

The missing rods are also the subject of a federal investigation that could result in criminal charges.

David Lochbaum, a nuclear engineer with the Union of Concerned Scientists, said the component referred to in the organization's scenario is the one that most resembles a fuel rod. Called an LPRM dry tube — Local Power Range Monitor — it is about the same size and shape as a fuel rod.

Nuclear instruments are inserted through the dry tubes into the reactor to calibrate core monitoring systems. There are more than three dozen of the tubes in the reactor and they have to be replaced every several years, he said.

Damaged and worn out dry tubes are stored in the plant's waste storage pool to allow them to radioactively cool before disposal. Using remotely-operated equipment, they are chopped up into two- and three-foot sections under the water and placed in disposal canisters for shipment to a low-level radioactive waste dump.

It is possible, Lochbaum said, that the missing fuel rods were chopped up in the same manner without the equipment operators ever realizing what they were. The storage container used to shield the radiation would have prevented detection of the rods by radiation monitors when the container was removed from the pool and shipped.

According to the Union of Concerned Scientists, the missing fuel rods contain 101.4 grams of fissile uranium and 40.2 grams of plutonium. They should produce a dose rate of 850 Rem per hour, enough to cause a lethal radiation exposure in about 30 minutes, Lochbaum said. By comparison, a fuel assembly that has just been removed from a reactor produces enough radiation to kill in seconds.

Lochbaum said all the evidence suggests that if the fuel pins were shipped and disposed, they were inside a radiation-safe container and pose no threat to public health. Lochbaum said he believes that if the fuel pins were misplaced within the storage pool, they would have been found by now.

"The pool is large, but not that large," he said. "We're not talking about searching the ocean for a needle."

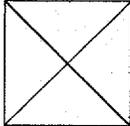
Beauchamp, however, said misplacement of the fuel rods in the pool remains a viable possibility.

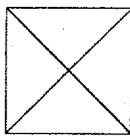
Though Northeast Utilities sold the Millstone Nuclear Power Station to Dominion Nuclear Connecticut in April for \$1.3 billion, NU remains in charge of the missing fuel investigation because the fuel rods were misplaced on its watch.

Millstone 1 last operated in November 1995. Millstone 2 and 3 continue to operate at the nuclear station.

On Dec. 14, 2000, the Nuclear Regulatory Commission was officially notified that the rods could not be accounted for. The rods are 13-feet, 2-inches long and about one-half inch in diameter. The two fuel rods were damaged and removed from a fuel assembly in October 1972. A map dated April 30, 1980, showed the fuel rods located inside a storage canister in the Millstone 1 spent fuel pool. The next spent fuel map, dated Sept. 18, 1980, showed neither the canister nor the fuel rods.

By the end of the summer NU expects to complete the internal investigation into what happened

to the fuel rods. 

 [Go Back](#)

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Millstone 1 officials visited King of Prussia, Pa., recently to tell the Nuclear Regulatory Commission what they think happened to the two fuel rods that went missing during a high-level radioactive waste inventory in November.

During this meeting, Frank Rothen, vice president of nuclear services for former Millstone owner Northeast Utilities, said that when investigators make a final report on the matter in June, they either will have (a) found the lost fuel rods or (b) found that they cannot find the fuel rods.

If it turns out to be (b), he said, they will make an educated conjecture as to where they might be.

Meanwhile, they are investigating 27 "plausible" scenarios as to how these items may have gotten lost.

If that seems like a lot of scenarios, consider this: Bob Fairbank, project manager for the investigation, said this list was narrowed down from 72.

We don't mean to seem unsympathetic. Who among us hasn't lost her car keys or even — from time to time — his car?

And we recognize that this is serious business. After all, lost radioactive fuel rods are not the same as lost car keys.

(For one thing, the fuel rods are about a half-inch in diameter and 13 feet long and tend to pose a slightly larger hazard to living things.)

But we couldn't help but wonder: If the best you can do after considering 72 scenarios is to come up with an educated conjecture, then have you really considered all the possibilities?

We did a little brainstorming here, tapping into our own experiences, and came up with over a dozen scenarios that we're willing to bet were never even considered.

We think one of the following could explain the missing fuel rods:

- n They fell into the crack behind your sofa cushions.
- n The cleaning lady misplaced them. This happens to us all the time. Whenever our cleaning lady comes to tidy up, it takes us weeks to find everything she has "put away."
- n Have you looked in the back of the fridge lately? Yeah, back there behind that cottage cheese with the green hair.
- n They're under those leaves you never got around to raking up last fall.

n Remember last year's employee picnic? Remember that skinny barbequed kielbasa that somehow just didn't taste right?

n Someone's kids took them to school for show and tell.

n The guys on that MTV Jackass show used them as poles for their urban gondolas. (Kids, please, don't try this at home.)

n They're right in front of you. You know how when you're looking for something, it's sometimes in plain sight? What are those things you've been stepping over as you walk into your offices every day? As our mother always said, "If they were a snake, they would have bitten you."

n They're parked about halfway down Row Z34 in the mall parking lot.

n They have vanished into another dimension beyond time and space.

n They're with the elusive red map. You know, the original red-lined map showing the boundaries of the Mashantucket Pequot Tribe's federally established reservation that everyone's been looking for.

n They — and you and the red map — are merely constructs of the matrix.

n A Star Trek crew came back and retrieved them to save the universe during one of those time travel episodes.

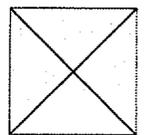
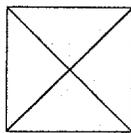
n Space aliens abducted them for use as anal probes. Think about that the next time you're abducted.

n Homer Simpson threw them out the car window.

Oh sure, we know what you're going to say: These are not "plausible" scenarios.

But how plausible is it that a nuclear power plant just happened to misplace two highly radioactive fuel rods?

As we said, these ain't car keys.



Nuclear fuel rods still missing after further searching

Spots in storage pool most likely to contain rods already examined

By [Paul Choiniere](#) - [More Articles](#)

Published on 2/2/2001

Waterford — The odds are increasing that officials at Millstone Nuclear Power Station may never be able to account for two spent nuclear fuel rods first discovered missing in November following an audit of the spent fuel storage pool.

Robert V. Fairbank, project team manager for the missing fuel investigation, said personnel recently completed searching those sections of the Millstone 1 spent fuel storage pool considered most likely to contain the fuel rods. The search of those areas, accounting for about 20 percent of the pool, turned up nothing.

"We had every expectation that those efforts would result in us finding those rods, but unfortunately that wasn't the case," Fairbank said.

The update on the missing fuel rod situation was provided to the Millstone 1 Decommissioning Advisory Committee during a meeting Thursday night held at the station's training center. Only a few members of the general public attended the meeting.

Plant personnel are now digging in for an extensive search that could drag into the summer, extending past the April 1 date when Dominion Resources Inc. is scheduled to finalize its \$1.3 billion purchase of Millstone from Northeast Utilities. Frank Rothen, vice president of decommissioning activities at the closed Millstone 1 plant, said the investigation team would remain in place after Dominion takes control.

Fairbank said the next several weeks will be spent planning how to search the other 80 percent of the spent fuel pool, sections where the highly radioactive nuclear waste is packed more tightly together and where there are fewer "nooks and crannies" where the fuel rods could have been inserted. The company is also examining thousands and thousands of records for some clue as to what happened to the two errant rods.

Also in attendance at Thursday's meeting were representatives of the Nuclear Regulatory Commission. Todd J. Jackson, a health physicist with the NRC, said the agency has confirmed that this is the first time in the history of the nuclear industry that spent nuclear fuel has not been accounted for.

Michael T. Masnik, chief of the decommissioning section of the NRC's Division of Licensing Project Management, said the case is being viewed with great seriousness by the federal regulatory agency. Failure to account of nuclear fuel is a violation of federal regulations, but Masnik refused to speculate what action the agency may ultimately take. At this point it will continue to monitor NU's investigation.

Joseph Coleman, an East Lyme resident and member of the advisory committee, said it appears ever more likely the fuel rods will never be located. If the fuel rods are not found in the pool there will be no other options to pursue, he said.

"It seems to me that at that point there's not much more you can do, except run up the flag and say, 'We lost them,'" Coleman said.

The last reference to the fuel rods in Millstone records, dating back 20 years ago, stated the rods were stored in a special container in a corner of the 38-foot deep storage pool.

Masnik said there is no reason to believe the fuel rods pose a threat to public safety. NU officials have said the two fuel rods might have either been moved to a different location in the spent fuel storage pool and the change not properly recorded, or they could have been accidentally shipped off site to low-level radioactive waste dumps in either South Carolina or the state of Washington. In either case, say company officials, they would be safely contained.

Legally, there is no place to take spent nuclear fuel in this country. Shipping the two fuel rods, accidentally or not, would have been a violation of federal regulations. Masnik said if it is determined the fuel rods were shipped, the NRC will then have to determine if it is better to retrieve them or leave them be.

A records review discovered the problem of the misplaced rods and an internal Millstone report was filed Nov. 16. May 1979 engineering notes refer to the two fuel rods — 13-feet, 2-inches long and a half-inch in diameter — as being stored in a special container in the northwest corner of the pool. An April 1980 report confirmed that location. But a September 1980 inventory of the spent fuel pool makes no mention of the fuel rods, first removed during an inspection of possible fuel rod damage in 1972.

A special crane and remote cameras are being used to conduct the storage pool search.

The NRC officials said they do not expect the incident to hold up the sale to Dominion and NU executives have promised to take full responsibility for the cost of finding them and any liability that may result. ■

[Go Back](#)

www.TheDay.com: Eastern Connecticut's News Source

January 8, 2001

A Sheepish Hunt for Missing Fuel Rods

By DAVID M. HERSZENHORN

WATERFORD, Conn., Jan. 6 — If they could enlist the public in their high-pressure search, officials at the huge Millstone nuclear power plant here would be forced to post a sign saying something like this: "Lost: two spent nuclear fuel rods, 12 feet long and slender as a pinkie finger. Last seen in April 1980. Highly radioactive. May have been mistakenly shipped to South Carolina or Washington. Reward."

It may sound like a scene from "The Simpsons," but Millstone's predicament is quite real and, federal regulators say, unprecedented in the nation's highly regulated atomic energy industry. While there is virtually no risk to the public — wherever they are, the rods are almost certainly stored safely, officials say — their misplacement has both alarmed people who live near Millstone and highly embarrassed the plant's operators.

The episode is the latest black eye for Millstone, which is about to be sold and has been trying to rebuild its reputation after garnering one of the worst safety records of any nuclear power plant in the country. In the mid-1990's, all three of the reactors at Millstone were closed for safety violations; units 2 and 3 have since reopened. Officials decided it was not cost effective to reopen Millstone 1. And in 1999, the nuclear subsidiary of Northeast Utilities, which owns Millstone, pleaded guilty to 23 federal felonies and was fined a record \$10 million.

Rather than fear, the general reaction on all sides has been a mixture of frustration, dark humor, disgust and disbelief. "It seems unbelievable to me, with all the experts you have over there, how you could lose something like this," a grandmother and retired correction officer, Billie Staub, told plant officials at a public hearing in Waterford Town Hall on Thursday night. Another person asked if they realized they were the "laughingstock" of the industry.

Chagrined Millstone managers seemed to realize this only too well. At the hearing, they offered two theories, that the rods were still somewhere in the plant's spent fuel pool or that they had mistakenly been shipped to an out-of-state disposal center. "We're not at all pleased that it happened," said the decommissioning officer for Millstone 1, Frank Rothen. "The feeling is that's the only two places it could be."

While a mistaken shipment of spent fuel would constitute a violation of federal regulations, neither scenario would present any danger to the public, regulatory officials said. Still, the explanations were met with anger and derision from local residents who have long been suspicious of Millstone because of its checkered past. "Maybe they're in the town dump," one heckler at the meeting called out. "Or on the Little League field."

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For conspiracy theorists, the disappearance of two highly radioactive fuel rods offers a chance for breathless speculation. Reconstituted fuel rods could, theoretically, be used to make plutonium. Perhaps the rods were stolen by international terrorists. Or domestic militia members. Or maybe it was a political plot, an effort to discredit Northeast Utilities just as it is preparing to sell Millstone to Dominion Resources, a Virginia energy company.

But even some of Millstone's staunchest opponents concede that there is virtually no way the rods could have left the plant in anything but a properly protected shipping cask without setting off numerous alarms. "Superman, maybe," said Pete Reynolds, a former Millstone employee who worked on the refueling floor and said he was fired in 1994 after reporting safety violations. "These are not made out of kryptonite. He's the only one I know of that could have walked away with it."

Mr. Reynolds added, "Anybody with any common sense that knows anything at all about nuclear power, they are just laughing."

The federal Nuclear Regulatory Commission, however, did not seem amused. "Obviously we are concerned that they are not able to trace where these rods are," said Diane Screnci, an agency spokeswoman. "We are maintaining close contact to stay up on the status of this investigation."

Officials discovered that the two rods were missing in November during a routine inventory conducted as part of the effort to decommission the plant's original reactor, Millstone 1, permanently. Millstone documents last account for the rods in April 1980, listing their location in a container in the plant's spent fuel pool. But as of September 1980, plant records no longer accounted for them.

Last month, officials carried out an initial search of the pool, more than 900 square feet of borated water, 40 feet deep, where old fuel rods and other radioactive garbage and debris are kept. The pool contains nearly 2,900 bundles of rods called fuel assemblies. But they found no sign of the two missing rods.

One reason they are difficult to locate is that they were not part of a bundle that rods are usually kept in.

The General Electric Company, which manufactured the rods, had removed them from the bundle in 1972 to make some repairs. In the process, one was damaged and the other could not be refitted into the bundle. Instead, they were stored in a container and put into the spent fuel pool, said Peter Hyde, a Millstone spokesman.

A team of experts from G.E.'s nuclear division are now in Waterford to assist Millstone with a more thorough search of the spent fuel pool. Millstone officials, who stressed that whatever mistake that was made occurred two decades ago, said they are also searching through hundreds of thousands of pages of old records to figure out what happened.

If the rods are not in the pool, one possibility is that they were mistaken for long tubelike radioactivity monitors that plant employees use and often dispose of in the spent fuel pool. Discarded monitors are often cut up and shipped off with other

radioactive garbage to low-level waste centers. The radioactive waste is wrapped in a liner and shipped in a special cask, both of which are made with lead and concrete. At the dump sites, the waste is buried in accordance with federal regulations.

On the streets of Waterford and neighboring Niantic, those who knew about the missing rods seemed more disappointed than scared. "The fact that there was an error is ridiculous," said Deborah Cohen, a tile artist, standing outside a local supermarket. "This shouldn't happen in a nuclear power plant ever."

At the public hearing, Ellen Lazerow asked if Millstone officials "behind closed doors" had ever looked at each other, uttered an expletive and wondered, "What's the worst-case scenario?" Larry Temple, the general manager of Millstone 1, pondered the question for a couple of seconds before replying, "I would have to say, yes."

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Missing fuel rods no risk to public, NU officials say

Audience skeptical at meeting on decommissioning

By [Paul Choiniere](#) - [More Articles](#)

Published on 1/5/2001

Waterford — Officials involved with the decommissioning of the closed Millstone 1 nuclear plant tried to reassure an often-skeptical audience Thursday that the failure to account for two misplaced radioactive fuel rods poses no threat to public safety.

A discussion about the fuel rods dominated the meeting of the Millstone 1 Decommissioning Advisory Committee. The group's meetings are usually sparsely attended, but Thursday's session attracted about 50 people who squeezed into a basement meeting room in Town Hall.

After listening to repeated assurances from Millstone officials that there is no public safety threat, advisory panel member Geri Winslow of Waterford said she had heard enough.

"I don't know how you can keep saying there is no danger since you don't where they are. The danger to public safety may be remote, but there has to be some," Winslow said.

The officials insisted, however, that they are sure the high-level radioactive waste material is somewhere safe, they are just not sure where.

Bryan Ford, who is director of decommissioning at Millstone 1, said the two fuel rods might have been moved to a different location in the spent fuel storage pool and the change not properly recorded. Or they could have been accidentally shipped off site to low-level radioactive waste dumps in either South Carolina or the state of Washington. In either case, Ford said, they would be safely contained. Ford works for Entergy, the New Orleans-based company hired by Northeast Utilities to decommission and dismantle much of the Millstone plant.

There is no other reasonable explanation as to where the fuel rods could be, Ford said. If the fuel rods had been moved without the proper storage canister numerous alarms would have sounded, he said. And there is no place the canisters could have gone except to a licensed disposal site.

The problem for Millstone-owner Northeast Utilities is that, legally, there is no place to take spent nuclear fuel. Shipping the two fuel rods, accidentally or not, would have been a violation of federal regulations.

A Millstone assessment team concluded the probability that the fuel rods are in the storage pool is equal to, and perhaps slightly greater than, the probability that they were shipped.

A records review discovered the problem of the misplaced rods and an internal Millstone report was filed Nov. 16. May 1979 engineering notes refer to the two fuel rods — 12 feet long and the thickness of a man's finger — as being stored in a special container in the northwest corner of the pool. An April 1980 report confirmed that location. But a September 1980 inventory of the spent fuel pool makes no mention of the fuel rods, first removed during an inspection of possible fuel rod damage in 1972.

Inspections of the storage pool using remote cameras have turned up nothing. On Saturday, Millstone workers, assisted by General Electric personnel, will begin lifting fuel assemblies out of their storage racks

in the pool. Cameras will be used to examine the rack for signs of the fuel rods. There are 2,884 fuel assemblies stored in the pool and the inspection will be a painstaking process taking as long as three months, said Frank Rothen, vice president of nuclear services and the NU official who is overseeing the decommissioning by Entergy.

At the same time, Ford said, tens of thousands of documents are being reviewed to see if any refer to the two fuel rods.

“We feel like the answer is in there somewhere, in the paper trail,” said Larry Temple, general manager of decommissioning and an Entergy employee.

Rothen refused to speculate whether the missing fuel rod problem could delay the transfer of Millstone ownership to Dominion Entergy, a sale that is supposed to be finalized in April. To break up the NU monopoly and encourage competition in the electric power industry, Millstone station and its two operating reactors were offered for sale at auction. Entergy bid \$1.3 billion.

Bob Blodgett, a Waterford resident, said Millstone may be operating well now, but has a history of slipshod operations.

“How can we say alarms didn't go off and were ignored?” asked Blodgett. “You guys have inherited a lot of deceit and mistrust that were associated with that plant.”

Nancy Burton, attorney for the Connecticut Coalition Against Millstone, called the mix up over the fuel rods “a betrayal of the public trust.”

But Ronald McKeown, director of the group Friends of a Safe Millstone, said that while the misplaced rods is not good news, the company's openness about it is.

“This new leadership of Millstone has lived up to their word of rectifying problems and protecting the public,” he said. “We have every hope and expectation that a strong adherence to safety and sense of responsibility to the public will continue.” ■

[Go Back](#)

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Public invited to quiz Millstone officials about missing fuel rods

Meeting Thursday will delve into the incident

By [Paul Choiniere](#) - [More Articles](#)

Published on 1/3/2001

Waterford — The public will have its first chance to ask questions about the missing fuel rods at the Millstone 1 nuclear plant when a citizens' advisory committee meets Thursday at Town Hall here.

Pearl Rathbun of Niantic, co-chair of the Millstone 1 Decommissioning Advisory Committee, said plant personnel will provide the committee an update on efforts to locate the two fuel rods. The meeting begins at 7 p.m. There will be an opportunity for the public to ask questions and make comments, she said.

During an inventory in November of the spent nuclear fuel stored at the Millstone 1 plant it was discovered that the two fuel rods could not be accounted for. According to Northeast Utilities, the high-level nuclear waste may have been accidentally shipped to a low-level radioactive waste facility in Washington or North Carolina. It also may still be in the storage pool, but not in the location where it was supposed to be.

Not seen as a public threat

Spent nuclear fuel is considered high-level radioactive waste and its disposal at a low-level facility would be a federal violation, the company has conceded. NU has said the missing spent fuel does not pose a public health threat.

Millstone 1 has not operated since 1995. The spent fuel was inventoried in preparation for the sale of Millstone Nuclear Power Station to Dominion Energy. In April the Virginia utility is expected to take ownership of Millstone station, which also has two operating reactors.

The spent fuel rods are about a dozen feet long and the width of a man's finger. In 1972 a bundle of the fuel rods was examined for potential damage. In the process the two now-missing rods were bent and could not be reused. A document dating to April 1980 refers to the fuel being stored in the pool, but in a follow-up inventory conducted in September 1980, there is no mention of the two rods.

Pete Hyde, an NU spokesman, said company personnel, using remote cameras, are now doing an "exhaustive search" of the spent fuel pool where the highly-radioactive nuclear waste is stored.

General Electric, which manufactured the plant and the fuel, is assisting in the operation.

The 12-member nuclear advisory committee was appointed by the state's Nuclear Energy Advisory Council to monitor the progress of dismantling the closed nuclear plant. Until the news of the missing spent fuel surfaced, the decommissioning had proceeded without incident.

Like most people who heard the news, Rathbun said she was surprised to learn two fuel rods could not be accounted for.

"My reaction was: 'They're 12-foot long and very radioactive, aren't they a little hard to misplace?'" she said. ■

Activists: Missing rods reason for NRC review

By [Paul Choiniere](#) - [More Articles](#)

Published on 12/23/2000

Waterford — The Nuclear Regulatory Commission wants to take a closer look at whether the misplacement of two spent fuel rods at the Millstone 1 nuclear plant raises doubts about the ability of the company to safely handle more spent fuel at its Millstone 3 reactor.

On Nov. 28 Northeast Utilities received approval of a license amendment that allows it to increase the amount of spent fuel in the Millstone 3 storage pool from 756 assemblies to 1,860 assemblies. Each assembly has 264 spent fuel rods. The company needs the additional capacity to handle the spent fuel the plant will produce from now until its license expires in 2025.

Anti-nuclear activists had attempted to block the license amendment, contending that the addition of more spent fuel would increase the chance of a nuclear accident, particularly if mistakes are made in the way the spent fuel rods are organized in the storage pool.

On Oct. 26 the best hope for stopping the amendment appeared to pass when the Atomic Safety and Licensing Board denied the request for a full-fledged evidentiary hearing. The board ruled that Millstone operators have demonstrated the ability to safely handle the increased fuel storage.

But given the new information that two spent fuel rods were misplaced at the closed Millstone 1 plant, the Connecticut and Long Island Coalitions Against Millstone are asking that the matter be reopened. The five-member Nuclear Regulatory Commission has ordered the licensing board to consider the request to reopen. The board, in turn, has ordered NU and the NRC staff to file responses to the coalitions' motion by Jan. 8.

Meanwhile U.S. Rep. Edward J. Markey, D-Mass., a member of the Commerce Committee, has written to NRC Chairman Richard A. Meserve asking for a full accounting of all the facts surrounding the missing fuel rod problem.

"The regulation of nuclear material is vital to protecting our public's health and safety," wrote Markey. "Therefore, I urge the commission to thoroughly investigate this matter and to take steps to prevent similar incidents from occurring in the future."

Nancy Burton, the attorney representing the coalitions, said if given the chance, her clients could make a very good case that the misplacement of highly radioactive fuel rods shows that plant operators are not prepared to safely handle a larger amount of fuel storage at Millstone 3.

Pete Hyde, a company spokesman, said it would fully comply with any orders issued by the NRC. He said the plans at Millstone 3 and the issue of the missing fuel rods at Millstone 1, a problem dating back 20 years or more, are totally unrelated.

One of three reactors at Millstone station, Millstone 1 last operated in 1995 and has been permanently shut down. Millstone 2 and 3 are fully operational.

Workers at Millstone 1 are trying to locate the two fuel rods in the spent fuel storage pool at the plant.

They say it is possible that the fuel rods were accidentally shipped off site, most likely to low-level radiation waste dumps in South Carolina or Washington. That the fuel rods were not where they were supposed to be was discovered during an inventory of all nuclear waste at Millstone station. The inventory was conducted in preparation for transferring Millstone ownership to Dominion Energy of Virginia.

Spent fuel is considered high-level radioactive waste and its disposal at a low-level facility would be a federal violation.

The spent fuel rods are about a dozen feet long and the width of a man's finger. In 1972 an assembly was examined for potential damage and, in the process, the two now-missing fuel rods were bent and could not be used. A document dating to April 1980 refers to the fuel, but in a follow-up inventory conducted in September 1980, there is no mention of the two rods. ■

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OPINION

Looking For Pins In A Hot Haystack

By **CHRISTOPHER KEATING**
 The Hartford Courant

December 20, 2000

It's not like misplacing a pair of gloves. Those could be stuffed into a pocket, perched on a dresser, kicked under the car seat - maybe left at the supermarket.

But how do you lose track of two 12-foot nuclear fuel pins that - if anybody tried to walk away with them - would deafen the thief with alarms before he dropped dead of massive radiation?

Although they aren't sure how it happened, officials at the now closed Millstone 1 nuclear plant learned last month that an apparent record-keeping error 20 years ago has left them unable to locate two highly radioactive pins.

Officials believe the pins are either sitting safely with 140,000 others in a 45-foot-deep storage pool at the nuclear complex in Waterford or were safely shipped to a nuclear facility in California.

"Wherever they are, we're certain they're safe," said Peter Hyde, a Millstone spokesman. "They would not have gotten off this site without setting off every monitor around."

Nuclear regulatory authorities agreed there was no danger to the public.

But Nancy Burton, an attorney for the Connecticut Coalition Against Millstone, said the revelation of the missing pins is "absolutely mind-boggling" because of the high level of radioactivity.



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"I can understand losing a pair of glasses, but not two highly radioactive rods that have to be isolated from the public for 100,000 years," Burton said. "That's probably a conservative number. If they just found out, they weren't doing their job for 20 years."

The pins - whose uranium dioxide has been depleted, but remain highly radioactive - are among tens of thousands that have fueled the plant. About the width of an adult's pinky finger, they hold enriched uranium pellets in the same way a pencil holds lead, Hyde said.

They were not known to be unaccounted for until an inventory was taken for Dominion Resources Inc. of Virginia, which is buying the three-reactor Millstone complex from NU for \$1.3 billion.

The missing pins are the latest embarrassment for a nuclear complex that once was held up as a model for safe operation, but in later years was tainted by scandal, unsafe operation and record penalties.

NU pleaded guilty in federal court last year to felony criminal counts for its actions at Millstone and agreed to pay a record \$10 million in penalties for nuclear safety and environmental violations. The company pleaded guilty to willfully violating the federal Clean Water Act and 19 counts of knowingly falsifying training

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records for employees who sought to become nuclear plant operators.

Ernest C. Hadley, an attorney for Millstone whistleblower George Galatis, said Tuesday that he was not surprised that pins are unaccounted for.

"It's entirely consistent with the way they've always done business there," Hadley said. "The lack of accountability is alarming. They ain't making chocolates over there. Why their license was not revoked a long time ago is beyond me."

But one of the company's chief critics, whistleblower Paul Blanch, said he sees no connection between the missing pins and the later problems that culminated with the shutdown of all three Millstone plants in 1996.

When NU unknowingly lost track of the pins in 1980, NU had a different management team and was known as a leader in the industry for safe operation, he said.

"Up until the mid-'80s, Millstone was operated properly," Blanch said. "This was an honest mistake. I definitely don't see the connection [with other problems at Millstone]. It's not there."

If this type of mystery seems rare, it is. The Nuclear Regulatory Commission has never seen a similar case, said Neil A. Sheehan, an NRC spokesman. A preliminary review of the commission's records showed only one case in which nuclear fuel was reported missing, but never an entire pin, he said.

"It raises concerns for us that highly radioactive fuel is nowhere to be found," Sheehan said. "It's fair to characterize it as sloppy record-keeping."

The NRC has not taken action against NU, and Sheehan said it is premature to say whether any fines might be imposed.

The NRC, the company and Blanch all say there is no reason to believe that the radioactive material might be in an unsafe spot or that anyone in the general public is in any danger.

In the meantime, a team is working overtime to try to locate the pins.

"We are going to search every square

inch of that pool, and it's going to take from three weeks to a month," said Hyde, the Millstone spokesman.

"If they did leave the site, they definitely left in a shielded, lead-and-steel cask to protect the public health and safety. They were not supposed to be shipped, but if they were, they were sent in a safe way."

The tale begins in 1972, when a condenser leaked and saltwater from Long Island Sound got inside the pure-water reactor vessel. General Electric, which built Millstone 1, was called in to rebuild the fuel bundles, and the workers disassembled the fuel equipment.

During that process, two fuel pins became bent, according to NU's report to the Nuclear Regulatory Commission. Those two bent pins, containing burned uranium, were then placed in the storage pool, and company records show that they remained in the pool until early 1980.

But the records from September 1980 show that the pins, whose exterior skin is made of zirconium and aluminum alloys, were no longer on the special "map" that shows the location of the pins in the pool.

No one seemed to notice until last month when workers for Entergy Inc., the decommissioning contractor, were conducting an inventory in advance of Dominion's takeover of the plant in April 2001.

John Redding, a spokesman for GE Nuclear Energy, said in a telephone interview Tuesday night that there is no reason to believe the pins would have been shipped back to GE, which manufactured them.

"We placed those in storage for Northeast Utilities, and that was the end of our job," Redding said from California. "We don't own them. They own them, and would have the responsibility for disposing of them."

Hyde rejected the suggestion that the missing pins might indicate that Millstone 1 was operated in a sloppy fashion 20 years ago.

"It wasn't lax in the 1980s, but the safeguards of today weren't in place

then," Hyde said. "Today, it simply wouldn't happen here because the record-keeping is extremely demanding."

At NU's other nuclear power plants - Millstone 2 and 3, and the now closed Connecticut Yankee plant in Haddam Neck - all pins have been accounted for, officials said.

Now Millstone workers have their fingers crossed that they will solve the mystery.

"Time will tell," Hyde said. "We're just going to keep looking."

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If your gifts glow, call NU

Published on 12/20/2000

If you wake up Christmas morning and find two 12-foot-long rods hanging out of your Christmas stocking, call the Nuclear Regulatory Commission. Speed-dial that telephone if poles set off a Geiger counter, or glow brighter than the lights on your tree. And consider changing your behavior, for Santa might have left a gift more spiteful and certainly more creative than coal: the items could be the spent-fuel rods missing from Northeast Utilities' Millstone Unit 1.

Humor aside, the loss of the rods is an extremely serious event. Most officials say that no nuclear plant in the country has ever lost one spent-fuel rod, let alone two. NU managers are understandably worried, and are determined to find the rods and figure out how they got lost in the first place.

Because the movement of nuclear waste in the plants is recorded, Millstone knows the rods were in the spent-fuel pool of Unit 3 between 1972 and 1980. But then references to the rods disappeared from the records. Employees may have erroneously shipped the rods off the property with other nuclear waste, or the rods may still be in the plant, maddeningly concealed among the 150,000 fuel rods in the spent-fuel pool.

Workers discovered that the spent-fuel rods were gone while preparing an inventory of the plant prior to the sale of the units to Dominion Energy of Virginia. NU management wants to account for the fuel rods before giving Dominion the keys to the front doors in April.

It's not fair, really. This is not the Millstone that once was the poster child for all that could go wrong at a nuclear plant. Just under five years ago, Millstone made the cover of Time Magazine for the ham-handed way the place was run. Operations are different now, mostly due to the leadership of Leo Olivier, senior vice president and chief nuclear officer, and Bruce Kenyon, president of generation.

The units are performing well, perhaps better than at any time in their history. They are producing power at a bottom-basement cost of 4 cents per kilowatt hour. That's comparable to electricity from new, gas-fired turbines. Employee morale is up; the number of employee concerns are down. Millstone 3 has run for a record of more than 535 days, and Millstone 2 has been operating for more than 200 days.

Things are good, and employees have earned the right to be proud of the plants' performance. They've worked so hard, and past events were so discouraging for such a long period of time.

The last thing the company needs is a visit from the ghosts of mishaps past. Yet, until the fuel rods are accounted for, this incident will add a smudge to the record, even if the rods weren't lost on the watch of present managers. ■

[4Go Back](#)

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Anti-Nuke Groups: Missing Fuel Rods Raise Serious Questions About Safety Procedures

By [Paul Choiniere](#) - [More Articles](#)

Published on 12/19/2000

Waterford — A coalition of anti-nuclear groups contends that the Atomic Safety and Licensing Board should reconsider its approval of plans by Millstone Nuclear Power Station to reorganize nuclear waste storage racks at the Millstone 3 plant, a move needed to handle the nuclear waste the plant is generating.

New revelations that operators of the station's Millstone 1 unit cannot locate two spent fuel nuclear rods raise serious questions about the ability of nuclear personnel to safely handle more spent fuel at the Millstone 3 plant, claim the anti-nuclear activists.

On Oct. 26, the licensing board rejected a request by the Connecticut and Long Island Coalitions Against Millstone to hold a full-fledged hearing into the plans to allow more storage capacity at Millstone 3.

The coalitions and their attorney, Nancy Burton, said the case should be reopened and a hearing held because the problems at Millstone 1 is important new evidence.

In its ruling the licensing board ruled that Millstone-owner Northeast Utilities "has demonstrated that it can adhere to administrative controls, with adequate safety margin and defense-in-depth, without posing an undue or unnecessary risk to plant workers or the public."

In her motion for a rehearing filed Monday, Burton said the accounts about Millstone 1 change everything.

"It is (our) position that, had the licensing board been made aware that NU is unable to account for two highly radioactive spent fuel rods at Unit 1, it would have been unable to make such a finding and it would have been legally compelled to commence an evidentiary hearing as requested," states the motion for a rehearing.

NU maintains the failure to track the two missing fuel rods at Millstone 1 dates back to procedures used 20 years ago or more and are not relevant to the way the nuclear station is operated today.

One of three reactors at Millstone station, Millstone 1 last operated in 1995 and has been permanently shut down. Millstone 2 and 3 are fully operational.

Workers at Millstone 1 are trying to locate the two fuel rods in the spent fuel storage pool at the plant.

They say it is possible, however, that the fuel rods were accidentally shipped off site, most likely to low-level radiation waste dumps in South Carolina or Washington.

Spent fuel is consider high-level radioactive waste and its disposal at a low-level facility would be a federal violation.

It is possible, according to company officials, that the fuel rods were mistaken for detectors that are used in the reactor core. The detectors are similar in appearance to fuel rods and can be shipped to low-level waste facilities.

During an inventory being done in advance of the transfer of Millstone ownership to Dominion Energy, it was discovered that two of the uranium-filled fuel rods could not be accounted for at Millstone 1.

There are 2,884 fuel assemblies in the pool, collectively containing about 160,000 fuel rods, according to records filed by Northeast Utilities with the Nuclear Regulatory Commission.

The spent fuel rods are about a dozen feet long and the width of a man's finger. In 1972 an assembly was examined for potential damage and, in the process, the two now-missing fuel rods were bent and could not be used. A document dating to April 1980 refers to the fuel, but in a follow-up inventory conducted in September 1980, there is no mention of the two rods.

All the spent fuel stored at the Millstone 2 and 3 plants has been accounted for. Both plants are in operation. Dominion Energy of Virginia, which bid \$1.3 billion to buy the Millstone plants, is expected to take control of the station in April. NU was required to auction off the nuclear station as part of the state law deregulating the electric power generation industry.

The Nuclear Regulatory Commission is awaiting the outcome of NU's investigation before determining what action to take, according to a spokesman. ■

[4Go Back](#)

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Millstone can't seem to find two spent fuel rods

By [Paul Choiniere](#) - [More Articles](#)

Published on 12/9/2000

Waterford — Operators at the closed Millstone 1 nuclear plant have misplaced two highly-radioactive fuel rods. Company officials are expressing confidence the fuel rods are being stored safely; they are just not sure where.

Entergy Inc., the company cleaning up the nuclear plant that last operated in 1995, discovered the problem when it was doing an inventory of all the spent fuel produced by the plant during 25 years of service. It could not account for the two fuel rods that were removed from the reactor back in 1972.

The fuel rods could be in the plant's spent fuel storage pool, but not located yet, or they may have been transported to a General Electric facility in California, which manufactured them, according to company and federal officials. A more unlikely scenario, said the company, is that the fuel rods were transported to a radioactive waste dump.

Joe Besade, a Waterford resident and member of the Connecticut Coalition Against Millstone, made light of the confusion.

"Northeast Utilities thinks the deadly spent fuel rods are in a state beginning with 'C,' but not Colorado," Besade said. "So they're either on the East Coast or the West Coast. It's a good thing NU has narrowed it down."

Pete Hyde, a spokesman for the company, said the issue is attributable to a past problem in record keeping and is not reflective of how the nuclear station is run today.

"The record keeping at Millstone 2 and 3 is meticulous," said Hyde of the two operating plants at Millstone.

Filled with uranium pellets needed to trigger an atomic reaction, the spent fuel rods are 12-feet long and the width of a finger. Inside a nuclear reactor, hundreds of rods are grouped together in bundles called fuel assemblies. In 1972 an assembly was damaged and disassembled by General Electric. During the process the two fuel rods in question were bent and could not be reused.

Millstone officials say their records show the two rods were put in a special storage box inside the plant's spent fuel pool, where all the nuclear waste produced by the reactor is stored. Records dated 1979 and 1980 show the box stored in the northwest corner of the spent fuel pool. It is not there now and records after 1980 do not refer to it at all.

Since 1980 significant work has been done in the storage pool, with spent fuel assemblies moved around and into different racks as space in the pool began to get tighter.

Due to the unique nature of the special fuel rod box, Millstone operators do not consider it likely the fuel rods were shipped out as waste, but until the items are accounted for, they can't rule it out. There is no national facility for storing the fuel rods, classified as high-level waste. It would have been a federal violation to take such material to a low-level radioactive waste dump.

Hyde said Millstone officials will locate the fuel rods. The Nuclear Regulatory Commission is monitoring the situation. An NRC official refused to speculate about the location of the fuel rods.

“We just don't know at this point,” said Todd J. Jackson, lead NRC inspector for the Millstone 1 decommissioning. “There is no way to know where it went.”

Jackson said it was premature to discuss the potential for penalties against NU.

Hyde said the most likely scenario is that the fuel rods were relocated and are still in the 40-foot-deep spent fuel pool.

A container that may house the rods has been seen in the pool, but Millstone needs GE's assistance to inspect it. All work must be done in the pool using remotely-operated equipment and cameras. The water shields the radiation.

The ability to monitor spent fuel was the subject of recent hearings involving Millstone. The Connecticut Coalition Against Millstone, which has its office in Mystic, sought unsuccessfully to block a license amendment at the Millstone 3 reactor.

The amendment will allow Millstone 3 engineers to reconfigure and add storage racks at that plant so more waste can be stored in the spent fuel pool.

Opponents had argued the additional spent fuel increased the chance of an accident in the event fuel was placed in the wrong position in the pool.

In dismissing the coalition's petition opposing the amendment, the Atomic Safety and Licensing Board ruled in October that the company “has demonstrated it can adhere to administrative controls with adequate safety margin and defense-in-depth.”

David A. Lochbaum, a nuclear safety engineer for the Union of Concerned Scientists, testified for the coalition at the hearings. He said news of the misplaced fuel rods is disquieting.

“It's further proof that company promises to always put the fuel rods in only the right places in the Unit 3 spent fuel pool will probably be broken,” he said. ■

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