

Part I

In Sweden, A Tempered Approach To Nuclear Waste

by Ingrid Becker

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NPR, Morning Edition



Ingrid Becker/KQED

European geologists have conducted experiments in caverns like this one, at the Aspo Hard Rock Laboratory, since 1995. The Swedish nuclear company SKB hopes to store used nuclear fuel more than 1,500 feet below ground.

July 28, 2011 from KQED

First in a two-part series about the long-term storage of nuclear waste. Read Part 2



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Two of three reactors at the Forsmark nuclear power plant in Sweden. The country lacks oil reserves and gets about half its electricity from three commercial nuclear plants.

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At least two dozen countries around the globe get energy from nuclear power, yet not one has been able to pull off a permanent disposal site. Finding communities willing to live with such dangerous stuff has been a big sticking point. But in Sweden, two communities have stepped up, and are willing to take the country's waste.

Like many countries, Sweden has had its share of political meltdowns over nuclear power. Protests stirred an uproar in the early 1980s when the Swedish nuclear industry simply decided where to begin testing for a possible geologic disposal site.

But today, instead of deflecting protesters, the nuclear industry shuttles visitors by the busloads for guided tours of facilities. More than 1,100 feet below the surface, exotic machinery and copper tubes wide enough to fit two men fill an underground cavern carved from crystalline bedrock.

In this working lab in eastern Sweden, a private nuclear waste company tests methods for permanently storing used fuel. It plans to encase the fuel rods in copper capsules, then bury them 1,500 feet down in bedrock where it is supposed to sit for the next 100,000 years.



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As many as 10,000 people per year visit the underground Aspo Hard Rock Laboratory in Sweden — a test area for used nuclear fuel. Asa Nielsson (left) encourages visitors to the caverns to touch samples of clay that will be used to help seal canisters of the fuel.

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"It's very exciting to see, and it's an enormous project," says Jonathan Svensson, who is studying nuclear safety as part of his government job. "Just the time scale is incomprehensible."

Communicating With The Community

So how did nuclear waste in Sweden go from a toxic topic to a field trip? People in the area said the industry needed to start over with things like public participation, a transparent, predictable process and trust. The industry took these lessons to heart.

"We know that we have to meet people and communicate what we want to do, why we want to do it and how we will find a place for it," says Inger Nordholm, a spokeswoman for the Swedish Nuclear Fuel and Waste Management Company, or SKB.

Initially, company officials spent a lot of time just having coffee with people, explaining their plans. Then they began focusing on towns with stable geology, but also places where the people were used to living near nuclear power plants.



Thousands of tons of nuclear waste around the U.S. are waiting for a pickup that is decades away.

SLIDESHOW: Sweden's Road To Nuclear Waste Disposal **Sweden's Holding Tank For Nuclear Waste**

Oskarshamn was one of two communities in eastern Sweden that stepped forward after nuclear waste officials asked for volunteers willing to let them start geologic testing. Charlotte Lilliemark, who lives about 12 miles north of the town, was just the kind of person a nuclear power executive would want to avoid.

The former Stockholmer moved to the country to raise dressage horses and didn't want a waste dump anywhere near her.

"I couldn't see anything that was positive," she says. But then local government officials asked her to lead a community advisory group. She says they told her: "We think you could contribute to the work — we need to open all the questions and be clear and transparent, and we want you to participate if you want to."

And she did.

Sweden's Solution

Brita Freudenthal, a public relations officer from the Swedish Nuclear Fuel and Waste Management Company, SKB, explains plans for long-term storage of used nuclear fuel in the country.

Over coffee in the kitchen with her daughter, Lilliemark says she has spent 10 years studying the issues and advocating for her community. In the end, her community wasn't selected for the repository but through her involvement with the issue, Lilliemark says she learned a lot about the risks of not dealing with the used fuel. And it changed her thinking.

"I can't just close my eyes and imagine that the fuel is not here, because it is," she says.

Benefits For The Region

This spring, Swedish nuclear officials applied for a licensing application to build a geologic vault in the municipality of Osthhammar, about a two-hour drive north of Stockholm. If they get it, the facility could open in 2025.

"We believe that it will not create a stigma, but on the other hand create an interest in how to solve this very difficult issue that people in Japan and California and Germany must solve in one way or another," says Jacob Spangenberg, the mayor of Osthhammar.

The community will see some financial benefits: Besides new jobs and infrastructure, Osthhammar negotiated a deal with the company to receive approximately \$80 million for long-term economic development if the repository is approved.



Ingrid Becker/KQED

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Already the community gets money from a national waste fund to help it chart an independent course. It has retained technical consultants and hired five full-time employees. Spangenberg says Osthhammar learned how to ask tough questions, press for conditions and also to keep cool.

That's because, Spangenberg says, there are many people out there who want to manipulate the situation to their own advantage, "both from the industry, as well as those that are very much opposed."

There are still a lot of questions about the proposal, and there are critics who feel the community has fallen for a very sophisticated PR campaign. Ultimately, the community still has the power: Once regulators have completed their review, three or four years from now, Osthhammar gets to either veto the proposal or say, "Yes, in our backyard."

Part II

Nuclear Waste Piles Up As Repository Plan Falter

by Craig Miller

July 28, 2011

Audio for this story from All Things Considered will be available at approx. 7:00 p.m. ET



Michael Mariant/AP

Above-ground casks at the Diablo Canyon nuclear power plant store some of the utility's nuclear fuel. Because of a lack of a central repository, nuclear waste is piling up at individual reactor sites across the United States.

July 28, 2011 from KQED

Second in a two-part series about the long-term storage of nuclear waste. [Read Part 1](#)



Mark Ralston/AFP/Getty Images

The two nuclear reactors at the Diablo Canyon power plant on California's central coast provide electricity for about 3 million households.

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Diablo Canyon nuclear power plant on California's central coast has more than 1,300 tons of nuclear waste sitting on its back porch, waiting for pickup. The problem is, there's no one to pick it up.

The 103 other reactors in the country are in the same bind — it has now been more than 50 years since the first nuclear plant was switched on in the United States, and the federal government still hasn't found a permanent home for the nation's nuclear waste.

The two nuclear reactors at the plant generate steam that drives giant turbines, which in turn generate electricity that powers about 3 million households. Once the uranium rods that fuel the reactors are used up, they're removed and cooled down underwater, in temporary storage pools.

The trouble is, those "temporary" pools have become pretty permanent and crowded, as utilities load them up with more fuel rods, squeezing them closer together.

Since 1982, utility customers on the nuclear grid have paid \$34 billion into a federal fund for moving the waste to some kind of permanent disposal site — something the federal government still hasn't done.

"We've made progress, but it's taken an enormous amount of time," says Per Peterson, who chairs the nuclear engineering department at the University of California, Berkeley, and is part of a White House Blue Ribbon Commission on nuclear waste. "This country has an obligation to those states and those communities to take those materials and put them into deep geologic disposal, where they can be safely isolated for a very long period of time."

The recent nuclear disaster in Fukushima, Japan, renewed fears about spent fuel safety in this country, where 65,000 tons of nuclear waste have piled up at power plants — waste that produces more radioactivity than the reactors themselves. In response, California's Sen. Dianne Feinstein called hearings on Capitol Hill.

"It is clear that we lack a comprehensive national policy to address the nuclear fuel cycle, including management of nuclear waste," she said.

Stuck With The Waste

It's not like we haven't had time — 35 years ago, when Jerry Brown was governor of California the first time around, the state banned any expansion of nuclear power until there was at least one permanent home for the spent fuel.

Yucca Mountain in Nevada was the leading contender, until Nevada's residents said "not in our backyard."



The nuclear industry is engaging with the community and offering long-term financial benefits.

Sweden's Holding Tank For Nuclear Waste

In the meantime, utility companies like PG&E are stuck with the waste. During a visit three years ago, engineers at Diablo Canyon were preparing to move older waste from storage in pools to containers called dry casks.

"The spent fuel pools were not built large enough to hold all the fuel from the original 40-year license life, so we had to find alternatives for safe storage," said Pete Resler, head of PG&E's nuclear communications at the time. The company is now using some dry casks — huge concrete and steel canisters to store older, less radioactive waste. Each is anchored to its own concrete pad.

"Each one of those pads is 7-foot-thick concrete with steel rebar reinforcement in it," Resler says. Those pads are there as an extra measure because Diablo is situated near two significant seismic faults. There are now 16 of these canisters sitting on the plant grounds, with plans to fill 12 more in the next couple of years.

Though most agree that dry-casking is safer than leaving the fuel rods in pools of water, nobody's proposing it as a permanent solution. The head of the Nuclear Regulatory Commission, Gregory Jaczko, told Sen. Feinstein's committee that it's the best we can do for now.

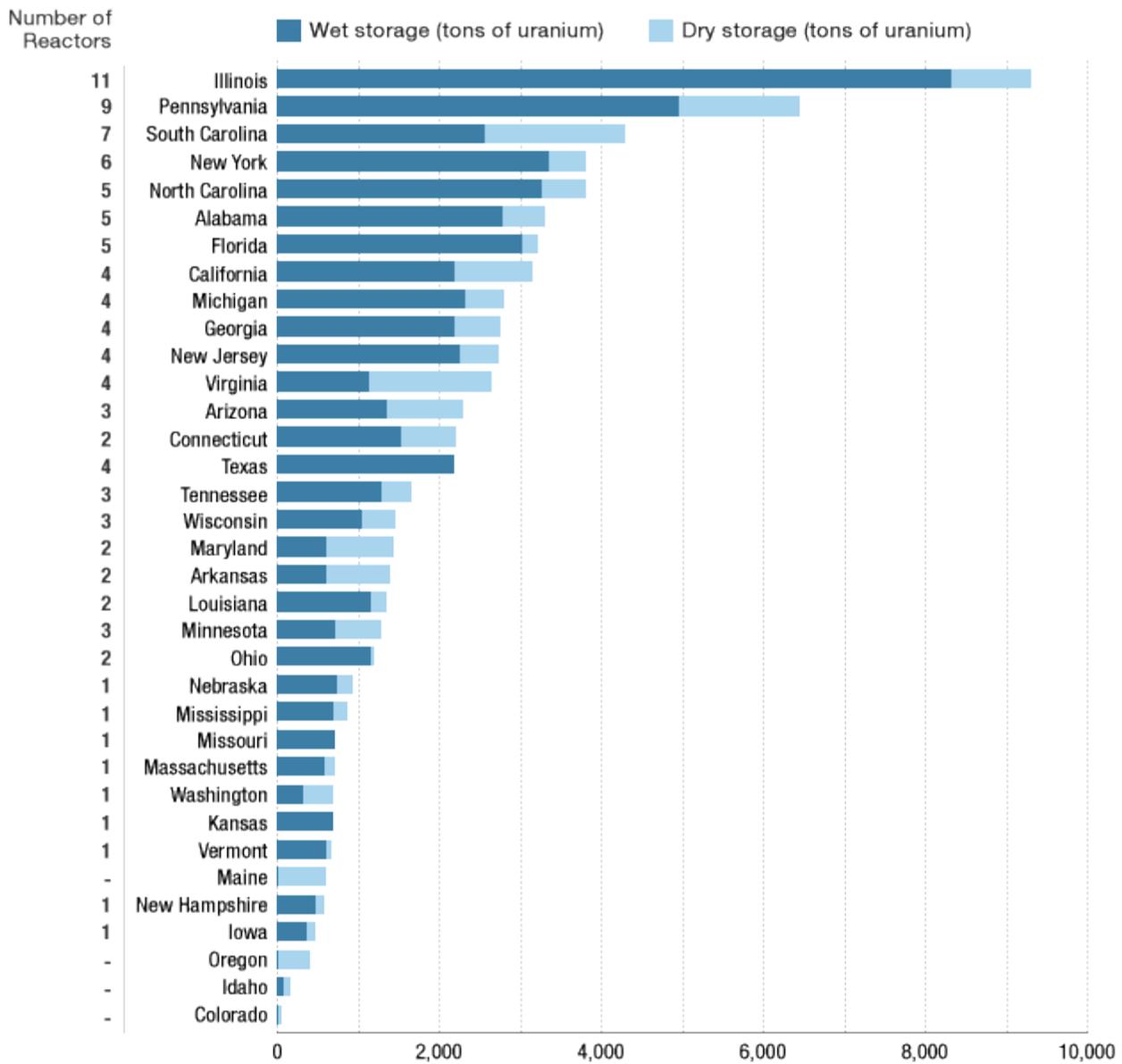
"Right now we believe that for at least 100 years, that fuel can be stored with very little impacts to health and safety, or to the environment," Jaczko said.

In the meantime, the Blue Ribbon Commission appointed by President Obama to find that way forward will issue another round of recommendations Friday.

They're likely to include more stop-gap measures, while the holy grail of a permanent home for spent fuel remains decades away.

Nuclear Waste In The U.S.

Without a permanent disposal site for used nuclear fuel, the fuel rods are accumulating at reactor sites across the country. Most of these fuel rods are being stored in pools of water. These large water tanks don't have the same kind of radiation shielding structures that the nuclear reactor cores have, but the used rods in them are less radioactive than new fuel rods. Below, a state-by-state look at how spent nuclear fuel is being kept.



Source: Nuclear Energy Institute, Nuclear Regulatory Commission

