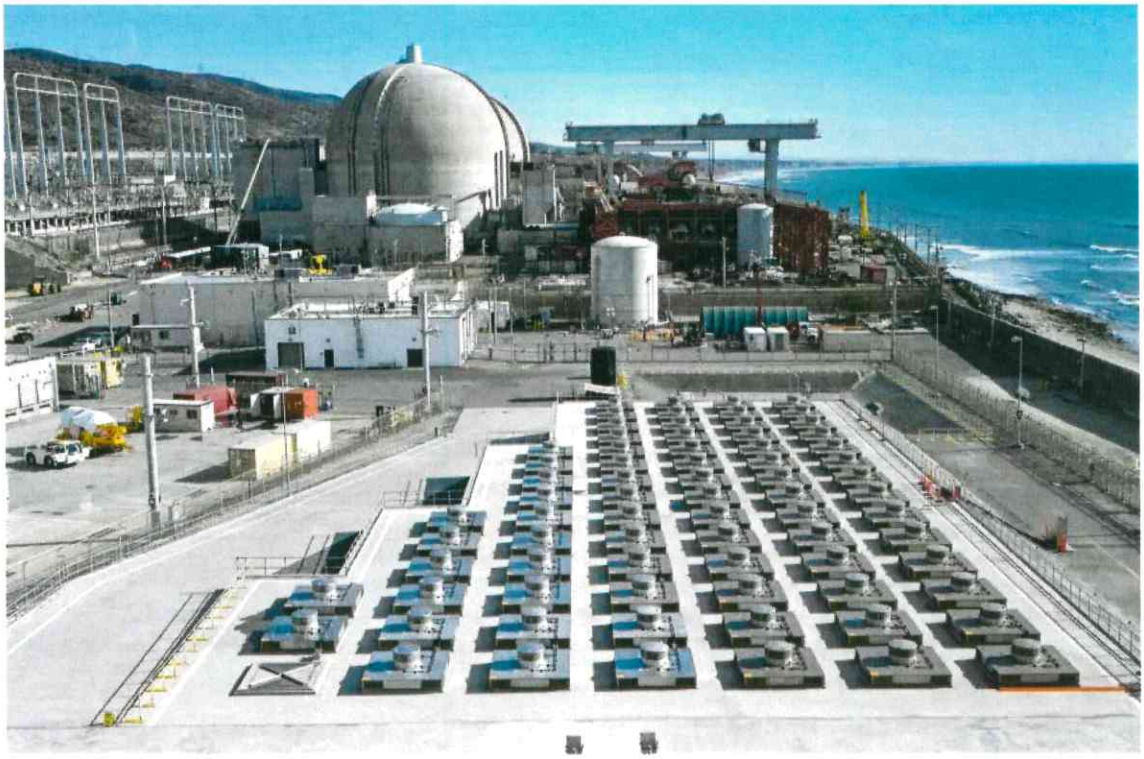
NEWS • Opinion Columnist

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Concerns about San Onofre are real, but experts debate level of risk

Column: Dueling experts share their greatest worries about the nuclear waste



Dry storage of used fuel rods at the San Onofre Nuclear Generating Station on Thursday, December 16, 2021. (Photo by Jeff Gritchen, Orange County Register/SCNG)



By TERI SFORZA | tsforza@scng.com | Orange County Register

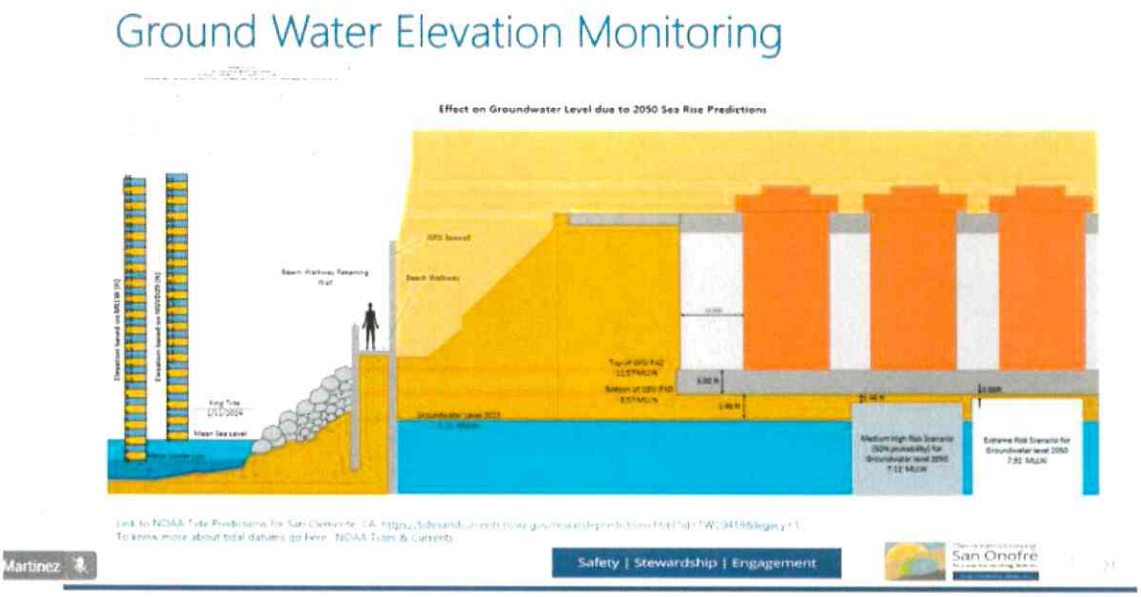
PUBLISHED: March 31, 2024 at 7:00 a.m. | UPDATED: March 31, 2024 at 7:03 a.m.

Let's all agree that storing 3.6 million pounds of highly radioactive nuclear waste on a bluff beside the ocean in an earthquake zone near



San Onofre Nuclear Generating Station in 2019. (File Photo by Leonard Ortiz, Orange County Register/SCNG)

And let's attempt to separate fact from fancy as we wait, and wait, and wait for that to happen — teasing what might be worth worrying about from, say, more performative panic. To that end, we'll curate a debate between two nuclear experts who have very different ideas on what we should fret over when it comes to the spent fuel in dry storage at San Onofre Nuclear Generation Station.



The highest predicted ground water levels near San Onofre's dry storage systems would still be below the floor of the waste storage system, Edison says (Source: Southern California Edison)

Meet the experts!

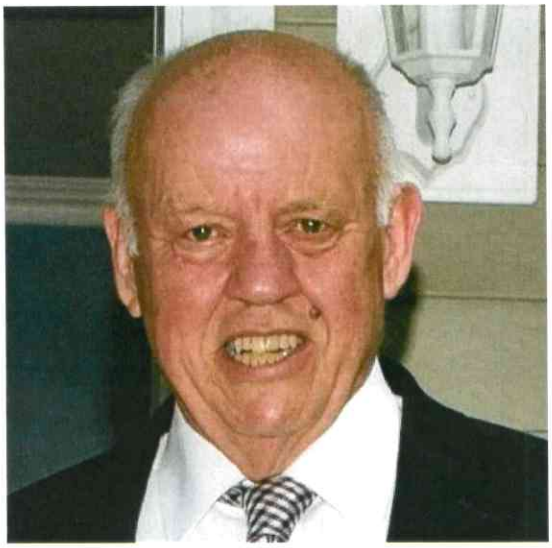
On one side we have David Lochbaum, recently retired director of the Nuclear Safety Project for the nonprofit Union of Concerned Scientists. Lochbaum has a degree in nuclear engineering and worked in the industry before becoming one of its leading watchdog/critics.

What do they worry about? Very different things.



Dave Lochbaum

Let's start with Blanch. "The bottom line is that there is a probability of flooding of the canisters in our present location. Should this occur, the impact on Southern California would be



Paul Blanch

unimaginable."

Blanch's nightmare scenario plays out like this: A giant tidal wave inundates the "concrete monolith" that is San Onofre's Holtec dry storage system. Most of the waste is inside canisters, inside vaults, inside that concrete monolith, just a few hundred feet from the ocean.

In this nightmare scenario, salt water and debris fill the vaults. The canisters inside are cool, as far as nuclear waste goes, at several hundred degrees. They're kept cool by airflow — a passive system that sucks in cool air and releases hot air, not needing any electricity to get the job done. But what would happen if the vaults were submerged in water?

Well, water was fine when the waste was cooling in spent fuel pools (it cools in those pools for years after its tour of duty in the reactor core is done). So why fear water now? The presence of boron in cooling pool water, and the precise spacing between fuel assemblies, kept things under control, Blanch argues. Salt water would not have boron. Waste might not be spaced well enough to prevent "criticality." After water boiled away, salt and debris could remain inside the vaults, potentially blocking cooling airflow to the hot canisters. Big trouble, he said.

And some of the waste canisters suffered scratches on their way into the vaults. If a scratched canister came into contact with cool water, would it crack like a 400-degree Pyrex bowl suddenly submerged in ice?

Edison and the NRC say this is just not a credible threat scenario. The area is prone to tsunamis in the 6-foot range, not the 30-foot range that could reach and flood the dry storage area. And if monster waves came anyway, the water would cool the canisters, then recede.

The seawall, which is not required, provides some protection from a tsunami — but it's redundant, as the older storage system (NUHOMS) is designed to withstand complete submergence up to 50 feet, and the new Holtec HI-STORM UMAX is designed to withstand complete submergence up to 125 feet, Edison spokesman Jeff Monford said.

Not credible.

Holtec's canister integrity monitoring program is designed to prevent, detect, monitor and address any cracking or corrosion. At SCE's request, Holtec also will provide an empty dry storage canister to be used for advanced testing and inspection techniques at San Onofre to enhance existing industry aging management programs. In addition, SCE will leverage the Holtec project by partnering with the Electric Power Research Institute (EPRI) to apply leading-edge inspection techniques at San Onofre.

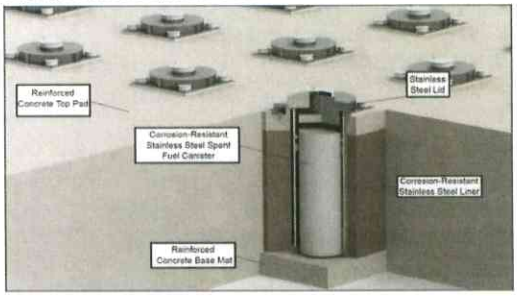


Image courtesy Holtec

"What do you mean by 'credible'?" Blanch asked. "They won't define it. I'll agree that getting hit by a meteorite is not credible because the probability is so low. But what is the probability here? One in a thousand years, one in a million years? What we're really looking for is the analysis that shows, should these become flooded, what are the consequences? I cannot get an answer."

A hydrology analysis was done in the 1970s by Basil Wilson, when the two newest reactors were planned — below sea level. San Onofre

Blanch argues that's not enough. He says updates are based on Wilson's very old study and fresh investigation should be done.

"A major accident is acceptable in the nuclear field if it's one in 10 million in one year. That's what we're looking for. That's more than safe. One in a million would probably be safe to me. But someone needs to say it. I don't know what the probability is. They have not done it."

He's not saying flooding *is* a problem. But he wants to see an analysis showing it *isn't* a problem, he said.



Big waves pound the concrete wall below San Onofre Nuclear Generating Station, where 3.6 million gallons of nuclear waste is kept. Rock rip rap were put in front of a sea wall with hopes it will help keep the sea from damaging the facility.(Photo by Leonard Ortiz, Orange County Register/SCNG)

Other worries

Lochbaum, meanwhile, probably couldn't disagree more.

"I have zero concerns about the spent fuel in dry storage at San Onofre being vulnerable to flooding from tsunamis," he said. "Forget Dr. Wilson's studies from the 1970s — SCE has commissioned more recent assessments that show the threat to be negligible. Zero concerns. At most.

"I do have concerns about dry storage of spent fuel, at San Onofre and elsewhere. But none are tsunami-related. None."



This Google Earth image shows how close the dry storage area for spent nuclear waste is to the water at San Onofre Nuclear Generating Station. (Image courtesy of Google Earth)

Instead, Lochbaum's concerns center on the dry storage systems themselves and what will happen to them over time.

Casks containing the waste are vulnerable to wear and tear and degradation as they age. Once ensconced in steel and concrete and locked away, it can be hard to assess how time is treating them.

"NRC requires — or 'suggests,' more accurately — and a very few casks get inspected every now and then," Lochbaum said. "Not a safety spotlight, more like a very infrequent safety strobe light flashing, perhaps, once in awhile.

"Fortunately, a dry cask experiencing a through-wall crack isn't like a balloon popping — all the contents won't be swiftly released," he said. "But the safety margins protecting the public will be reduced. That's bad."

Alas. Pre-shipment inspections are not required by the NRC. But Edison said it would inspect them anyway, because it's a responsible actor.



Loading spent fuel into the Holtec dry storage system at sunset. (File photo courtesy Southern California Edison)

"I have zero reason or evidence to doubt SCE's sincerity," Lochbaum said, "but I'd take more comfort in pre-shipment inspections being required by law rather than voluntary.

"If mandatory, and assuming San Onofre was not the first site to ship casks away, there'd be a database of inspections to show whether casks are, or are not, solid."

Edison



The older one — the Orano TN-NUHOMS system that stores canisters horizontally — holds 50 canisters and is at that 20-year mark. In November 2021, Edison and Orano conducted a "baseline inspection," finding no signs of degradation of inspected canisters, Edison said.

The other system is Holtec's UMAX —the aforementioned "concrete monolith" — which stores canisters vertically. There are 73 waste canisters inside, the last of which were loaded in 2020.

Dry fuel storage systems are initially licensed for 20 years by the Nuclear Regulatory Commission. After that, an "aging management program" is required to evaluate "degradation mechanisms to determine if they could affect the ability of dry storage system components to fulfill their safety functions," Edison explains. If all is well, the licenses can be renewed for 40-year intervals.

So while it won't need an aging management program for the Holtec for years, Edison agreed to an "accelerated Inspection and Maintenance Program" nonetheless, including periodic canister inspections; a test canister program; radiation monitoring and reporting; and developing a way to inspect and repair canisters inside their vaults inside the concrete monolith.

In 2020, Edison sent repair robots — sort of like high-tech St. Bernards — into a test vault to find and fix a test-damaged canister. One robot carried inspection cameras. The other, a nozzle mounted on a movable arm. Using magnetic wheels to crawl around, the robots found the trouble spots and applied a metallic overlay of nickel, effectively sealing them.

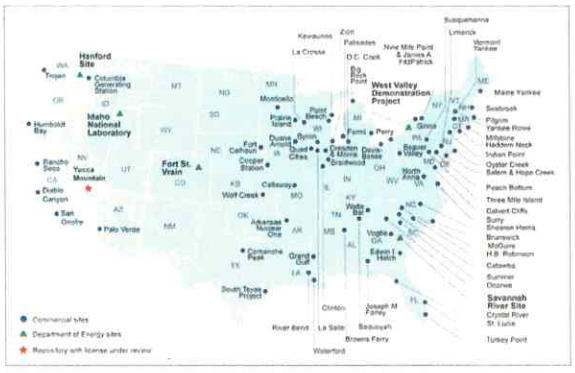
When the time comes to move them to federal storage, each canister will be shipped inside a very heavy, shielded, sealed and helium leak-tested cask, adding another layer of containment, Monford said. Edison's license does require that most, if not all, the canisters be inspected and/or tested prior to shipment.

Blanch doesn't worry about flooding of the horizontal canister system — water can just drain out the bottom, he said — but he does worry about the vertical Holtec. "I don't think, in the short term, we're going to have any problems with spent fuel canisters, for the next 50 years or so," he said. "But we're going to start developing problems."

He'd feel a lot better if the dry storage systems were hoisted another 20 feet in the air.

Lochbaum would feel a lot better if more regular and rigorous inspections of dry storage systems and canisters were required.

And all of us would feel a lot better if the federal government stopped dithering and finally found America's commercial nuclear waste a permanent home, as it promised to do so many decades ago.



The U.S. Government Accountability Office's map of sites storing spent nuclear waste in the United States.

The Trust Project

Taboola Feed

Spent Fuel Solutions
Desmond and Foley CEP Email
March 2024

Subject: Spent Fuel Solutions Coalition Updates

Dear Chairman Stetson and CEP Members,

As we mark Spent Fuel Solutions' (SFS) third anniversary, we have much to celebrate in the spent fuel policy space. Our coalition continues to actively advocate for the legislative changes needed to develop a flexible and durable spent fuel management program that includes both consolidated interim storage (CIS) and permanent disposal. Achieving this goal will require amendments to the Nuclear Waste Policy Act (NWPA), and we have identified six key policy priorities:

- Congressional authorization to form a single-purpose, autonomous federal organization to assume management of the program from the U.S. Department of Energy (DOE).
- Reliable and adequate funding such as access to the Nuclear Waste Fund.
- Authorization for a flexible, consent-based repository siting program that does not designate a particular repository, whether Yucca Mountain or other.
- Revisiting the linkage between CIS and a repository to allow for near-term offsite storage, with flexibility to allow input from potential host communities without defining consent.
- Authorization for the U.S. government to expand the application of federal title to and liability for spent fuel to include private interim storage.
- Actively engaging states, tribes, and local entities affected by transportation beyond the NWPA's scope by adding a public information program and emergency preparedness, including modest funding where appropriate.

We began meeting with federal leaders to discuss potential legislation to amend the NWPA and are planning a trip to Washington, D.C. later this spring. Comprehensive amendments to the NWPA will not be easy and will require support from both sides of the aisle. It will also require the support of our members and others who want to see the spent fuel at the San Onofre Nuclear Generating Station (SONGS) relocated to an offsite facility.

In addition, SFS continues to pursue public education and engagement opportunities. In late January, we hosted our fifth Spent Fuel Solutions webinar, which featured local officials from international host communities, including Vesa Lakaniemi, Mayor of Eurajoki Municipality, Finland, and Jacob Spangenberg, former Mayor of Östhammar Municipality, Sweden. You can find a video of the webinar on our website, www.spentfuelsolutionsnow.com/events. We plan to continue our quarterly events this year and look forward to sharing more in the future.

Best regards,

Supervisor Jim Desmond
San Diego County
Spent Fuel Solutions Co-Chair

Supervisor Katrina Foley
Orange County
Spent Fuel Solutions Co-Chair

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King tides, groundwater rise: Threats to nuclear waste at San Onofre?

Column: No, say Southern California Edison officials lay out data. Critics don't believe them.



Big waves pound the concrete wall below San Onofre Nuclear Generating Station that supports the path that connects north and south San Onofre State Beach in San Diego County on Wednesday, June 23, 2021. South-facing beaches were pummeled by a storm surge that caused waves in the 4-foot to 7-foot range in addition to extreme high tides nearing 7 feet by nightfall. (Photo by Leonard Ortiz, Orange County Register/SCNG)



By **TERI SFORZA** | tsforza@scng.com | Orange County Register

PUBLISHED: March 9, 2024 at 7:00 a.m. | UPDATED: March 9, 2024 at 7:03 a.m.

As sinkholes appear in the road to the beach near the shuttered San Onofre Nuclear Generating Station, Headrick and many others say the radioactive detritus must move to higher ground as quickly as possible. But evidence shows that's not necessary just yet, said Southern California Edison, which oversees the plant's tear-down.



Todd Moore of Costa Mesa checks out the rain-eroded road leading to San Onofre State Beach on Tuesday, Feb. 6, 2024.(Photo by Mindy Schauer, Orange County Register/SCNG)

Edison presented its state-mandated study of sea level rise near the plant on March 7 — 238 pages chock full of pictures and measurements and graphs and projections — concluding that, "as designed and with minimum regular maintenance," the rocks, sea wall and retaining wall between the waste storage area and the ocean will be just fine through at least 2050, and likely well beyond.

Another worry of critics — that groundwater will eventually rise higher than the concrete floor of the dry storage system, soaking into the concrete and perhaps corroding the steel canisters encasing the waste — is not a realistic threat either, the study concludes.

SONGS reactors 1, 2 and 3 were built dozens of feet below sea level, said Ron Pontes, Edison's decommissioning manager for San Onofre, at the online Community Engagement Panel meeting Thursday. "Even then, we never saw evidence of water infusion."



The dirt road leading into San Onofre surf beach after the latest storm. (Photo courtesy of State Parks)

Below-sea-level structures have been demolished over recent years, and were "bone dry," Pontes said.

So a rising sea should pose no threat to the integrity of the systems protecting 3.6 million pounds of spent nuclear fuel for many decades, even if there's flooding. And officials hope the federal government — which is contractually obligated to dispose of commercial nuclear waste, but hasn't, which is why it has piled up at San Onofre and other nuclear plants nationwide — will find a solution before anything major needs to be done shore up/relocate/etc. San Onofre's dry storage systems.

Critics, however, aren't disposed to believe the study's charts and graphs and measurements.

"We all know the danger," said Alice McNally. "Saying everything is hunky dory is a disservice. … It's time to stop painting a rosy picture and make the public aware of the danger of the status quo."

High seas



File photo, Mark Rightmire, ORANGE COUNTY REGISTER/SCNG

Yes, the walkway behind the rocks is relatively low and "likely will be overtopped under large wave conditions, especially if these occur during extreme high water levels," the study said.

"However, the impact of wave run-up and overtopping on the walkway itself or on public access is limited and temporary, since the beach will not be accessible during such conditions, and floodwater has adequate drainage from the site and off the public walkway."

Yes, sea level rise "will likely increase both the wave forces on the rocks (due to greater water depth and wave height fronting

But the revetment has high "adaptive capacity … in the sense that its current stable condition, along with occasional maintenance, will allow it to continue functioning as intended," the study said. "The revetment, in its present condition, is likely to tolerate wave forces with acceptable rock movement that will not affect the integrity of the revetment as a whole…. as designed and with minimum regular maintenance, the revetment will withstand wave forces over the next 30 years," while the retaining wall, and walkway will provide additional protection to the seawall.

Over time, as waves act on the rocks, they move around, Pontes said. Edison restacks them every five years or so. The last time was around 2016, and planning is underway to decide when to do it again.

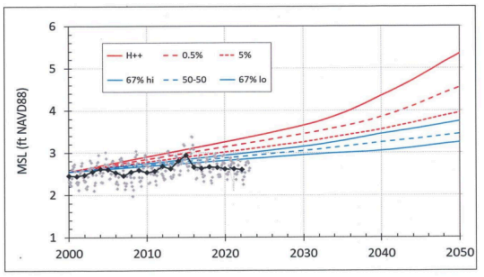


Figure 2-2. La Jolla average MSL data, 1925-2022, annual (black), monthly (grey) (upper). Same for 2000-2022 (lower). Both with OPC (2018) La Jolla MSLR projections, 2000-2050 (see legend and text).

The red and blue lines are predicted sea level rise under various scenarios. The black line is the mean actual levels recorded near San Onofre (Source: Southern California Edison)

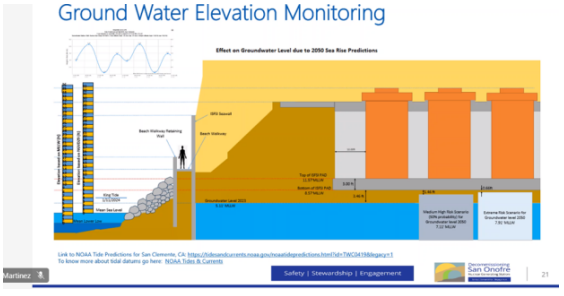
The seawall itself is not meant to block a tsunami, but simply to protect the site from erosion. And despite its weathered appearance, it continues to do exactly that.

In the unlikely event that the dry storage systems were flooded, they'd simply drain, officials said.

Groundwater

As sea levels rise, groundwater levels are expected to rise as well.

What if the water table rises higher than the bottom of the waste storage system? Will the concrete suck up water? Will the water seep into the vaults holding the steel canisters holding the radioactive waste? Will water degrade those canisters — especially the ones that were scratched on their way into the vaults?



The highest predicted ground water levels near San Onofre's dry storage systems would still be below the floor of the waste storage system, Edison says (Source: Southern California Edison)

No, Ponte said. Even under the most extreme scenarios, groundwater is predicted to remain below the bottom of the storage systems by almost one foot. The floor of the structure is 3 feet thick, and the concrete is dense — the same kind of concrete used to construct underwater structures like piers and dams. Even if groundwater did rise above the floor, the concrete wouldn't wick up water, he said.

Garry Brown, of Orange County Coastkeeper, was skeptical. "We use the word predicted a lot," he said. "It means we really don't know. … When you have small tolerances, it's a cause for concern."

"You're right, we don't know what the future holds," Pontes shot back, explaining that Edison is required to report based on older state guidance that actually predicts more extreme water rise than we've been seeing.

"Let's assume it's much more aggressive," Pontes said. "If the water table exceeds the bottom of (the storage system), the question we should be asking is, 'Is that a problem?' The answer is no. It's not a problem. Groundwater could continue to rise above the bottom and not be a problem.

"Why? Because the concrete is very dense. Water would have to find a way to migrate through the concrete to find its way to a canister. Let's say it did. That stainless steel cavity enclosure is closed and welded on the bottom. It's



Dry storage of used fuel rods at the San Onofre Nuclear Generating Station in Camp Pendleton, CA, on Thursday, December 16, 2021. (Photo by Jeff Gritchen, Orange County Register/SCNG)

How do we know that? The nuclear plant itself was built below sea level back in the 1970s. “Bone dry,” Pontes said. “We’re fulfilling our duty. We don’t think there’s a problem here.”

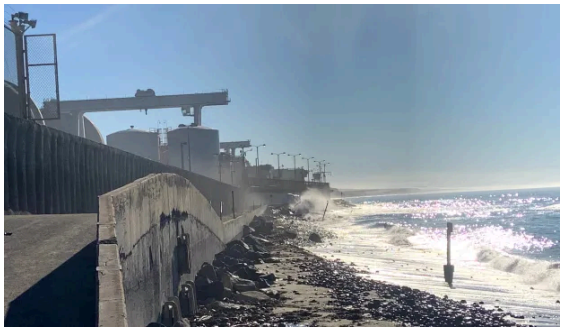
In 2035, Edison will have to tell the state when the waste will be moved to federal storage. There will be more data on sea level rise by then. If the waste is still there and risks increase, they’ll be dealt with.

Disappointed

Headrick, of San Clemente Green and the soggy sea wall, was disappointed.

“I’d say there are plenty of reasons to at least take a closer look at the situation with the latest technology, as recommended by one of the researchers,” he said by email. “It’s my understanding that they have the power to give that direction immediately….

“We all hope it turns out to be in a safe, dry condition, but even so, there are other things to be looked at more closely. There are canisters with obvious damage and no way to repair them if they continue to get worse and possibly fail.”



An image taken during a “King Tide” in 2020 shows water hitting a rock barrier near the San Onofre nuclear plant. (Photo by Laylan Connelly/SCNG)

Edison said it has, indeed, developed a way to repair canisters inside their vaults. In 2020, it sent repair robots — sort of like high-tech St. Bernards — into a test vault to find and fix a test-damaged canister. One robot carried inspection cameras. The other, a nozzle mounted on a movable arm. Using magnetic wheels to crawl around, the robots found the trouble spots and applied a metallic overlay of nickel, effectively sealing them.

That doesn’t much comfort Headrick. Water inundation damages pipes and foundations, he said, and it needs more study at San Onofre. Replacing the canisters with something thicker, that can be used for long-term federal storage, seems prudent. There’s no time to waste getting the waste moved to higher ground, he has said.

An unlikely scenario, at best. Other locations on the Navy property were considered and rejected. The storage systems in place cost hundreds of millions of dollars to build and maintain. Entrepreneurs try to drum up enthusiasm for temporary waste sites, where America’s commercial nuclear waste might be consolidated, but those efforts are always blocked by lawsuits from folks in the surrounding communities.



This Google Earth image shows how close the expanded dry storage area for spent nuclear waste will be to the shoreline at San Onofre Nuclear Generating Station. (Image courtesy of Google Earth)

The best bet continues to be prodding the federal government, which bears the ultimate responsibility, and has some $46 billion set aside to do it to boot.

We’re waiting.

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