How an unused nuclear power plant became home to a world-class acoustics lab

It's kind of impossible to grasp the enormity of a cooling tower until it's suddenly right next to you. Never used for their intended purpose, the cooling towers of Washington Nuclear Projects 3 and 5 (WNP-3 and WNP-5) loom over treetops as I drive up to Satsop Business Park, about an hour and a half outside of Seattle. This abandoned nuclear power plant — a strange mix of massive concrete structures in various states of completion — has been repurposed as an advanced acoustics testing facility.

I visited Satsop on a drizzly day in March to meet Ron Sauro, owner and operator of NWAA Labs. Sound-dampening construction materials, noisy washing machines, even the crew cabin of an airplane — these are all things that have passed through the doors of his lab. When companies need to verify how much sound their products make — or how well they dampen sound — they call Ron. I meet him in the parking lot just outside his office and follow

him past a sign that states, in no uncertain terms, that I'm entering the premises at my own risk. I make my way into the finished but never-used auxiliary building that would have housed WNP-3's nuclear reactor.

The auxiliary building that would have housed WNP-3's reactor is now home to NWAA Labs.

It's unfortunate that the Washington Public Power Supply System, or WPPSS, chose a name with an acronym that so easily translates to "whoops!" Construction started on WNP-3 and WNP-5, twin nuclear power plants on the same site, in 1977. They ran over budget, and the accident at Three Mile Island in 1979 put a damper on everyone's enthusiasm for nuclear energy. By 1982, both projects were mothballed, even though WNP-3 was nearly complete.

WPPSS tried to find a buyer in the '90s, but nobody was in the market for a defunct nuclear power plant. The buildings and land wound up in the hands of the Port of Grays Harbor, which now maintains it as Satsop Business Park. It has hosted film productions, an Overstock.com call center (now closed), and, at one point, thousands of recalled VW vehicles sold back to dealers following an emissions-cheating scandal.

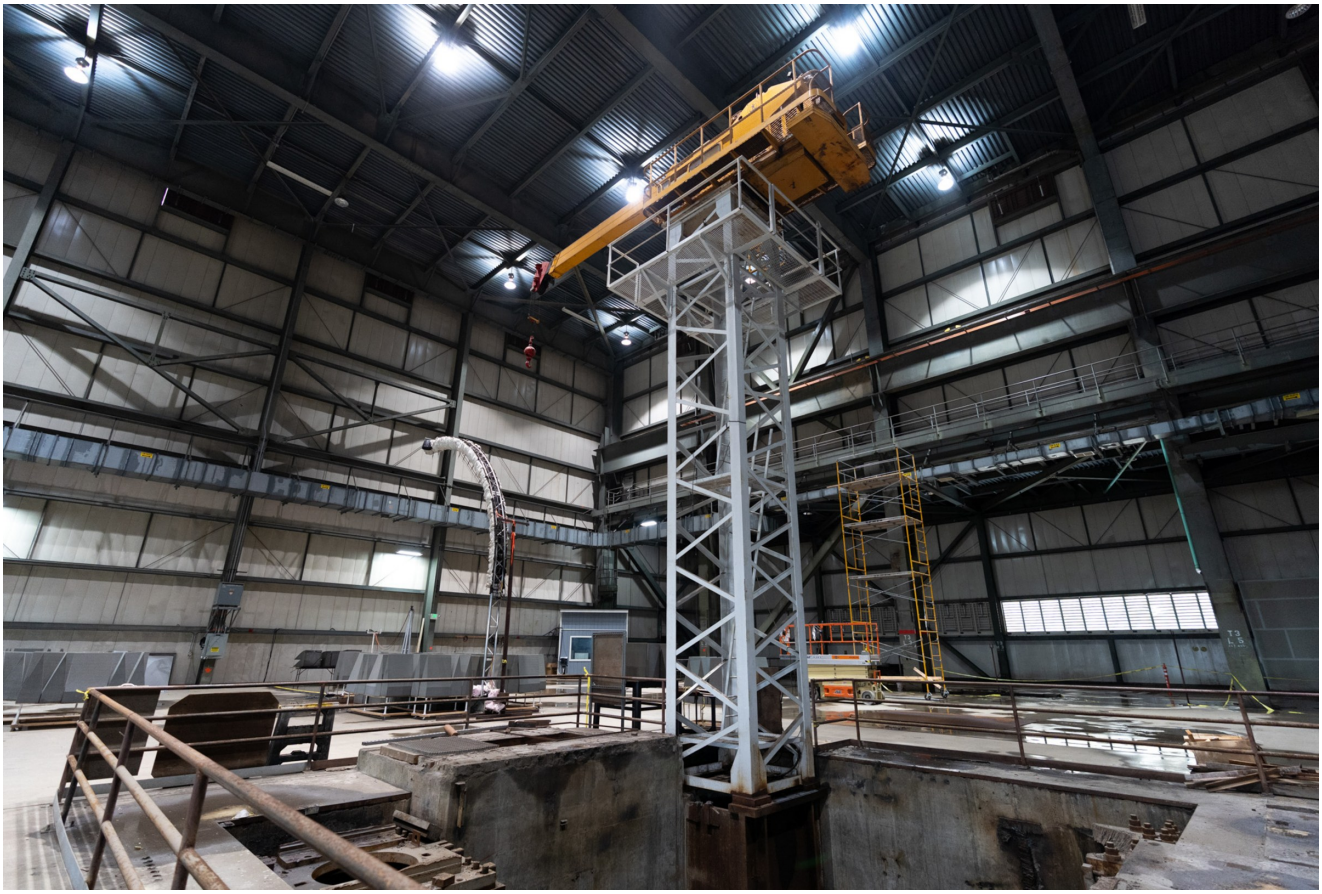
Much of the office space seems unoccupied at the moment, and I get the sense that the "business" part of the park never quite took off like the Port was hoping. Most people are unsure what to make of a defunct nuclear power plant, but Sauro isn't most people.

He and his wife Bonnie opened NWAA Labs in 2010 after convincing the building's ownership that they could build an acoustics lab in the facility in five months as a proof of concept. Fifteen years later, they're still operating it out of Satsop, and as far as acoustic lab spaces go, it's safe to say this one is one of a kind.

To measure how much sound something makes, or how much sound it absorbs, you need a controlled space. Standards organizations including the American National Standards Institute (ANSI) and the International Organization for Standardization (ISO) offer strict guidelines for different kinds of acoustical tests. They include specifications for the room the test is carried out in, how much background noise is acceptable, and the instruments used for testing. The job of an acoustics lab is to follow those specifications to guarantee a level of consistency. If Sauro tests a soundproof building material in his lab, you can bet that another lab somewhere else would get nearly the same result. Clients use that information to help inform their designs or ensure that their products conform to standards for noise emissions.

Stepping through the threshold of the auxiliary reactor building, Sauro points out the exterior walls: five feet thick, made of solid concrete and sturdy rebar. I follow him on a curved path marked with yellow lines around the structure that would have housed the reactor; its round cave-like opening is dark and covered by a padlocked fence. A loud rustling by the entrance startles me, and I see a large bird tuck itself into a nook above the door. As we continue into

the building, Sauro tells me a cautionary tale of a careless member of a tour group who fell 500 feet down an unfinished elevator shaft and didn't survive. I focus on keeping between the yellow lines until we reach the building's elevator — the finished one, that is.



Sauro uses this crane to lift speakers into place on the free field testing rig, to the left.

Sauro was in the market for a mountain. A former NASA scientist, he was looking for a new home for his acoustics lab in Washington state after relocating from California. The couple was considering building a facility into a quarry's hillside, but when they got word that the former nuclear plant was starting a new life as a business park, they looked at the reactor building. "If you can't find a mountain, you make a mountain," he says. He made that mountain inside of WNP-3.

Acoustics testing, as best I can tell, is two-thirds science, one-third witchcraft. "You have to be better than the thing you're testing," Sauro explains as a general scientific principle. In acoustics, that means creating a controlled space to measure sound, without interference from background noise. Satsop's remote location means there's not much in the way of outside noise to deal with; the thick concrete walls take care of the rest.

The insulation provides another benefit: stable temperature and humidity, which are important when you're studying how sound moves. No matter what temperature it is outside, it's somewhere around 54 degrees inside of the reactor building. Sauro says that building a

place with the kind of temperature control required to run his lab would have cost millions; in the reactor building, temperature control is a permanent feature.

Sauro takes me to the second floor, where the control room was once located. The couple converted two neighboring rooms into reverberation chambers with a 12-by-10-ft opening between them. This allows them to test materials for soundproofing and transmission loss. They put up the material in the opening between the two rooms; sound is generated in the "source" room and then measured on the other side in the "receive" room to see how much got through. The receive room is a kind of floating room-within-a-room — the ceiling is suspended by springs, and the floor and walls are all separated from the rest of the building. Sauro says it's the quietest non-anechoic room in the world, and just breathing raises the sound level by a thousand times.

Sauro tells a cautionary tale of a careless member of a tour group who fell 500 feet down an unfinished elevator shaft and didn't survive.

With these two rooms and a booth next to their office, they test everything from carpet samples to noise-canceling headphones for hunters. If a product makes noise, they can verify how much (or little) sound it makes. That matters to a company that needs to guarantee its products aren't so noisy that they'll damage the hearing of people who work around them every day — hence something like the noisy washing machine in the lab. But they also test things like the soundproof phone booths in corporate offices to verify how soundproof they are.

When I visited, there was a test panel set up between the two reverberation chambers. Sauro explained that it was a wall belonging to a SCIF, or a sensitive compartmented information facility, which is a structure that's impervious to sound and electromagnetic waves. Government officials use temporary SCIF structures when they're out in the field and need to discuss something top secret, which is some real James Bond shit.

Though WNP-3 provided a lot of built-in benefits for acoustic testing, it has proven to be a force of its own. The two reverberation rooms didn't come with an opening between them; Sauro added it. He hired a company to cut the hole in the concrete wall. Sauro says the initial estimate was around $1,500 for three hours of work. But the concrete was filled with so much thick rebar that it took a week and ended up costing more like $15,000 — as well as four or five pricey saw blades.

Next door in the turbine building, Sauro has a free field speaker testing rig set up. The turbine building is more than 600 feet long, with two 250-ton bridge cranes spanning the width overhead. Steam generated by the reactor would have been piped over to this building, turning the turbine which was connected to a generator. Sauro's testing rig is set up on the

turbine deck, which was a little soggy with a puddle here and there when I visited. The drizzle that followed me out of Olympia had turned into proper rain, and the 50-year-old roof wasn't quite up to the task.

The loudspeakers in the rig above help provide the sound "source" in the source room.

The free field rig is a little Lovecraftian. It's a tall structure with an arm that curves forward over a pedestal. The arm is covered in a kind of white insulation, and it's punctuated with 19 microphones pointing inward that look like teeth, or maybe daggers. When it's rigged up for testing, Sauro will put a speaker on the pedestal and play sound from it while it rotates. The resulting data gives a three-dimensional picture of the speaker's performance.

Sauro tells me they used to share the building with another tenant that built diesel tanks for 20 hours a day. You really can't test audio equipment when that's happening, so he used to come up to the turbine deck to run tests at 1AM when it was quiet. That tenant left, and Sauro's skeptical that another will ever take its place.

"Nobody's ever come back and I don't think anybody's ever going to," Sauro says. "The roof itself will cost over $1 million to fix, and nobody's going to do that. We work around it." There are sound-absorbing foam spikes that can be positioned underneath the testing rig, and

Sauro points out that they're on wheeled carts so he can keep them off the ground and out of the puddles. But he's not bothered by the water coming from the roof, he says, "as long as it doesn't fall on a microphone."

That's the thing about a mountain. As Sauro puts it, "You work around it. It doesn't work around you." That's just the nature of a structure made to contain a nuclear reactor. "You can't modify it. It costs too much money and it's almost impossible physically to do." Tearing down a building meant to withstand a magnitude 10 earthquake isn't a viable option, either. "This building is gonna be around 1,000 years from now," Sauro says of the reactor housing.

Back in the comfort of their heated office, the couple tells me about the work they put in turning this place into a testing lab. When money was tight and they needed some rebar, they spent days hammering out thick scrap rebar left over from the building's construction.

Sauro's lease comes with ample storage space.

That kind of initiative comes in handy to save money, but it's also the work of a scientist. Sauro says that people often expect him to wear a white lab coat. "Real scientists dress like I do," he says, gesturing at his T-shirt and zip-up sweatshirt. "We work our butts off, and we do a lot of physical labor, a lot of construction." From his years at NASA to WNP-3, he has had

to assume a lot of different hats just to figure out the next step in whatever he was building or testing. “I’m a carpenter, a plumber, a welder, I can fix a car,” he says. “Anything that needs to be done, I can do. Because I have to.”

I thank the couple for their time, and on my way out of the building, I take another look at the massive concrete reactor housing. There’s no sign of the bird I saw earlier, but this time I see evidence along the seam of the reactor structure that seems to suggest a rodent population. With so much unused space and so many dark corners in this strange building, it only makes sense that the local wildlife would find a way in from the rain. When we no longer find a way to adapt to the structures at Satsop, nature surely will.