NEWS | ENVIRONMENT & HEALTH

Can Nuclear Power's Deadly Waste Be Contained in a Warming World?

Nuclear reactors are highly vulnerable to radioactive meltdowns in an era of rising climate disasters.

DEDMITYAY / GETTY IMAGES; EDITED: LW / TO

BY

Karen Charman, TRUTHOUT

PUBLISHED

September 23, 2019

PART OF THE SERIES

Covering Climate Now

SHARE

Imagine this scenario: You are driving home from work one evening, and you notice a strange metallic taste in your mouth. That night on the evening news, you hear there's been an accident at the nuclear plant in your community, but that everything is under control.

The next day, the metallic taste is stronger, and you see a rust-colored ring around the bathtub when you drain it. Public announcements continue to say everything is OK. Your eight-month-old daughter has been playing outside much of those two days.

The following day, the governor announces that pregnant women and women with preschool children within five miles of the plant should evacuate. You flee in terror with your daughter, husband and a friend, driving more than 250 miles to a town south and east on the coast. Before you go, you notice a strange thick, heavy, slightly glowing orange haze around the nuclear plant and over the area.

READING LIST

WAR & PEACE

Chomsky: Trump's Actions on Syria Reflect the Foreign Policy of a Con Man

Two days later, your daughter is projectile vomiting and has severe diarrhea; she's unable to keep down any food or water. Tests at a local hospital don't find any pathogens to explain her symptoms, and the medical receipt says "possible to probable radiation sickness." Her bottom is bleeding and so raw from the diarrhea and dehydration that you don't even bother with diapers. The projectile vomiting stops after three or four days, but the diarrhea continues for three weeks.

Hospital staff tell you to go to a Civil Defense station, where your car and belongings are scanned for radiation. The Geiger counter goes off the charts.

The day after the accident begins, your husband gets a bad headache that turns into a nasty sinus condition, and he is nauseous. You, your husband and daughter all have extremely sore noses that are too tender to touch. Your gums are purple and bleeding, and your sore noses and bleeding gums last for weeks. The metallic taste stays in your mouth for about three weeks.

You return home after three weeks. In the subsequent days, months and years, every time radioactive gases are vented from the nuclear plant, you know it — whether it's publicly announced or not — because the metallic taste returns. You are filled with rage and anxiety, and feel helpless to stop the ongoing radiation exposures. When your daughter is two years old, she is diagnosed with severe cataracts in both her eyes, which doctors attribute to juvenile rheumatoid arthritis.

When you file a medical claim for your daughter's radiation-induced illness with the nuclear plant's insurance company, you are told the claim is absurd. Eventually, 2,000 others in your community join a class action lawsuit for compensation for injuries and illness after the accident. But 18 years later, it is dismissed for lack of evidence after the judge disallowed virtually all of the plaintiffs' expert testimony. Years later, the official and widely accepted word about the accident that sickened, killed and terrorized so many people in your community is that

sickened, killed and terrorized so many people in your community is that nobody died. Then, 20 years after that, a study identifies radiation-induced thyroid cancers among area residents, challenging that assertion.

This is not a made-up story. It is what happened to Becky Mease, a nurse in her late 20s, and her family during and after the partial meltdown at Three Mile Island on March 28, 1979. And the railroading that Mease experienced when she tried to demand accountability for the poisoning of her family was not an isolated case, either — it is what happened to all the victims who attempted to get restitution for their suffering.

Nuclear Energy Is Not "Clean"

Ever since the nuclear industry became a global pariah following Three Mile Island and the much more severe accident at Chernobyl in 1986, it has been desperately trying to make a comeback.

In the late 1980s, then-chairman of the International Atomic Energy Agency Hans Blix began touting the idea that nuclear power should play a significant role in combating climate change because it does not release carbon while generating electricity, a position he continues to promote.

Several prominent advocates for addressing the climate crisis have taken up this call, some of the latest being Democratic presidential hopefuls Cory Booker and Andrew Yang.

But the fact that reactors don't emit carbon while operating doesn't mean nuclear energy is "clean." Because of the huge volume of deadly poisons that the nuclear fission process creates, nuclear reactors need an uninterrupted electricity supply to run the cooling systems that keep the reactors from melting down, a requirement that may be increasingly difficult to guarantee in a world of climate-fueled megastorms and other disasters.

The ongoing accident at the Fukushima Daiichi plant in Japan following the 9.0 earthquake and tsunami in March 2011 demonstrates the vulnerability of nuclear power plants to such disasters.

The fact that reactors don't emit carbon while operating doesn't mean nuclear energy is "clean."

Nuclear boosters have been remarkably successful in ignoring and erasing the health effects of radiation exposure, enabling them to downplay the impacts of serious accidents. In truth, reactor meltdowns, depending on where they occur, can kill and injure enormous

numbers of people and contaminate the air, water, land and food supply over thousands of miles with radiation. A 1982 study by the Sandia National Laboratory, one of the labs run by the U.S. Department of Energy, calculated deaths and injuries within a year of a core meltdown and subsequent cancer deaths at 76 different nuclear power plant sites, many of which were only proposed at that time. According to this study, the Salem nuclear plant outside Philadelphia could kill 100,000 people within a year, result in 40,000 subsequent cancer deaths and give another 70,000-75,000 people a range of radiation-related injuries. A 1997 report by Brookhaven National Laboratory on the potential consequences of a spent fuel accident also forecasted large numbers of fatalities.

Fission 101

The risks of radiation exposure are downplayed and easily dismissed as "irrational fear" because the physics and chemistry of the fission process and the radioactive elements it produces are complex and not understood by the general public and also because, except in cases of acute radiation poisoning, radiation is invisible.

Radioactive fission products are "variant forms of the ordinary chemicals which are the building blocks of all material and living

things," explains Dr. Rosalie Bertell in her book, *No Immediate Danger: Prognosis for a Radioactive Earth.* The difference is that stable, non-radioactive atoms have an equal number of protons and electrons.

Nuclear fission creates an imbalance between protons and electrons, producing enormous quantities of hundreds of different radioactive elements — the high-level waste and activation products — all of which seek to return to a stable state. These unstable atoms become stable by knocking out the extra particles fission created, a process she says takes hundreds of thousands of years.

"Every such release of energy is an explosion on the microscopic level," Bertell says. Radiation exposure is particularly damaging to the structure of cells, which is why it is necessary to keep these radioactive elements, known as radionuclides or radioisotopes, out of the bodies of humans, other living beings and the environment.

As climate models have long predicted, our warming world is now experiencing much larger and stronger storms with significantly more rainfall in the Earth's wetter areas and more sustained and severe drought and wildfires in the drier regions. In 2019, the hottest June on record triggered an unprecedented fire season in the Arctic, with over 100 intense fires. The summer of 2019 also saw 55 billion tons of water melt off Greenland's ice sheet in just five days, a rate scientists hadn't expected for 50 years.

A month before the massive ice loss in Greenland, scientists predicted sea levels could rise 6.5 feet by the end of the century, submerging nearly 700,000 square miles of land.

Most nuclear power plants are located beside rivers, lakes, dams or oceans because they need a continuous source of water to cool the reactors. In August 2018, *Ensia* reported that at least 100 nuclear power plants built a few meters above sea level in the U.S., Europe and Asia would likely experience flooding due to sea level rise and storm surges.

Though nuclear reactors vary in generating capacity, 1,000 megawatts is common. A reactor of that size contains 100 metric tons of enriched uranium fuel, roughly a third of which needs to be replaced with fresh fuel each year. According to radioactive waste expert Dr. Marvin Resnikoff, the spent fuel, also known as high-level waste, becomes 2.5 million times more radioactive after undergoing nuclear fission in the reactor core.

In a May 2011 report, Institute for Policy Studies (IPS) senior scholar Robert Alvarez, a top official at the U.S. Department of Energy from 1993 to 1999, described the danger of high-level waste this way: "Spent fuel rods give off about 1 million rems (10,000 sieverts) of radiation per hour at a distance of one foot — enough radiation to kill people in a matter of seconds."

The intense radioactivity the fission process creates is why reactor cores are surrounded by five-feet thick reinforced concrete containment structures and spent fuel must be shielded by at least 20 feet of water in pools for several years after it leaves the reactor.

As of September 2019, 444 nuclear reactors are operating in the world, with 54 under construction, 111 planned and 330 more proposed.

The Three Rs of Nuclear Accidents

David Lochbaum, nuclear engineer and former director of the Nuclear Safety Project at the Union of Concerned Scientists, says nuclear plants are basically vulnerable to three kinds of accidents. "I compare it to the three R's of reading, writing and 'rithmetic," he told *Truthout*.

The first R — radioactive decay and residual heat — caused three reactors at Fukushima to melt down after the tsunami flooded the plant and knocked out the emergency diesel generators that were meant to kick in to keep the plant's cooling system operating.

The second R is reactivity control. In this type of accident, operators lose control, as happened at Chernobyl. In that case, Lochbaum says, the reactor was only running at 7 percent power when worker mistakes accelerated it to 1,000 percent in less than a second or so. That blew the

building apart and released up to an estimated 9 billion curies of radiation into the air, contaminating many areas in Europe and eventually spreading radioactive particles throughout the northern hemisphere.

Decades of inventory of lethally hot spent nuclear fuel remain stacked in fuel pools at most of the world's nuclear power plants. These pose the most serious potential for Lochbaum's third R, an accident sparked by radioactive materials. The explosion of a radioactive waste drum at the Waste Isolation Pilot Plant, a nuclear weapons waste dump in New Mexico, in 2014 is another example of a third R accident.

Despite housing "some of the largest concentrations of radioactivity on the planet," Alvarez points out, spent nuclear fuel pools in the U.S., which currently has the world's largest reactor fleet, mostly reside in "ordinary industrial structures designed to merely protect them against the elements. Some are made from materials commonly used to house big-box stores and car dealerships."

Because fuel pools on average contain about six times as much irradiated fuel as a reactor core, a fuel pool accident could be significantly worse than a reactor meltdown. So far, no fuel pool accidents have occurred, though one was only narrowly averted at Fukushima.

The ongoing accident at the Fukushima Daiichi plant in Japan following the 9.0 earthquake and tsunami in March 2011 demonstrates the vulnerability of nuclear power plants to such disasters.

Anything that interrupts power to the reactor — whether it's a devastating wildfire, earthquake, tsunami, tornado, hurricane, ice storm, dam failure or some other unforeseen incident — poses a risk of nuclear disaster. "All plants are vulnerable to loss of power for an extended period," Lochbaum said. "The pathway to get there varies from plant to plant."

In the U.S., the nuclear industry is responding to the risk of indefinite power outages with a strategy called FLEX. Plant owners are required to purchase portable backup pumps, hoses and diesel generators housed on-site. FLEX also relies on equipment and supplies, like diesel fuel, being trucked or flown in from other places.

Lochbaum is not confident that FLEX is adequate to protect the public from nuclear disaster in a warming world. Over the 20 years he monitored the industry and its government overseer, he says the U.S. Nuclear Regulatory Commission (NRC) has gotten increasingly complacent — and often hostile toward its own staff members who raise questions — about the potential dangers of a technology capable of doing long-lasting, deadly harm over enormous distances.

The nuclear industry and its supporters, of course, see it differently.

In a *Bloomberg Businessweek* feature in April 2019, former *New York Times* reporter Matthew Wald, who covered the nuclear industry for years and is now a spokesperson for the Nuclear Energy Institute, the industry's lobby group in Washington, D.C., downplayed the concern: "There is a perennial problem in any high-tech industry deciding how safe is safe enough," he said. "The civilian nuclear power industry exceeds the NRC-required safety margin by a substantial amount."

Yet safety standards set by an agency rolling back safety inspections, loosening safety requirements, permitting less public disclosure of problems, and limiting public input does not inspire confidence.

Nor, Lochbaum says, will it likely serve the nuclear industry's quest for revival. "If you truly want to expand nuclear power, what's going on now is the exact opposite of what you should do," he said. If they don't regulate the plants and instead let the owners do it and cause a bad accident, that could halt nuclear power. "Just like in Japan, that will bring them all down," he said.

But at what cost to public health and safety?

This story is part of Covering Climate Now, a global collaboration of more than 220 news outlets to strengthen coverage of the climate story.

Karen Charman

Karen Charman is freelance investigative environmental journalist who has written extensively about nuclear issues. Her stories on nuclear power have appeared in *The Nation*, *World Watch Magazine*, *Extra!*, *On The Issues*, *The Progressive*, *WhoWhatWhy*, *TomPaine* and the academic journal *Capitalism Nature Socialism*.