



It Sounds Crazy, But Fukushima, Chernobyl, And Three Mile Island Show Why Nuclear Is Inherently Safe

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PHOTO CAPTION: Fukushima was a public health catastrophe, just not one caused by radiation. Shutterstock

After a tsunami struck the Fukushima Daiichi nuclear plant in Japan eight years ago today, triggering the meltdowns of three reactors, many believed it would result in a public health catastrophe.



“By now close to one million people have died of causes linked to the Chernobyl disaster,” wrote Helen Caldicott, an Australian medical doctor, in *The New York Times*. Fukushima could “far exceed Chernobyl in terms of the effects on public health.”

Many pro-nuclear people came to believe that the accident was proof that the dominant form of nuclear reactor, which is cooled by water, is fatally flawed. They called for radically different kinds of reactors to make the technology “inherently

safe.”

But now, eight years after Fukushima, the best-available science clearly shows that Caldicott’s estimate of the number of people killed by nuclear accidents was off by one million. **Radiation from Chernobyl will kill, at most, 200 people, while the radiation from Fukushima and Three Mile Island will kill zero people.**

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In other words, the main lesson that should be drawn from the worst nuclear accidents is that nuclear energy has always been inherently safe.

The truth about nuclear power's safety is so shocking that it's worth taking a closer look at the worst accidents, starting with the worst of the worst: Chernobyl.

The nuclear plant is in Ukraine which, in 1986, the year of the accident, was a Soviet Republic. Operators lost control of an unauthorized experiment that resulted in the reactor catching fire.

There was no containment dome, and the fire spewed out radioactive particulate matter, which went all over the world, leading many to conclude that Chernobyl is not just the worst nuclear accident in history but is also the worst nuclear accident possible.

Twenty-eight firefighters died after putting out the Chernobyl fire. While the death of any firefighter is tragic, it's worth putting that number in perspective. [Eighty-six firefighters died in the U.S.](#) in 2018, and 343 firefighters died during the September 11, 2001 terrorist attacks.

Since the Chernobyl accident, 19 first responders have died, according to the [United Nations](#), for "various reasons" including tuberculosis, cirrhosis of the liver, heart attacks, and trauma. The U.N. concluded that "the assignment of radiation as the cause of death has become less clear."

What about cancer? By 2065 there may be 16,000 thyroid cancers; to date there have been [6,000](#). Since thyroid cancer has a mortality rate of just one percent — it is an easy cancer to treat — expected deaths may be 160.

The World Health Organization claims on its web site that Chernobyl could result in the premature deaths of 4,000 people, but according to Dr. Geraldine Thomas, who started and runs the Chernobyl Tissue Bank, that number is based on a disproven methodology.

"That WHO number is based on LNT," she explained, using the acronym for the "linear no-threshold" method of extrapolating deaths from radiation.

LNT assumes that there is no threshold below which radiation is safe, but that assumption has been discredited over recent decades by multiple sources of data.

Support for the idea that radiation is harmless at low levels comes from the fact that people who live in places with higher background radiation, like Colorado, do not suffer elevated rates of cancer.

In fact, residents of Colorado, where radiation is higher because of high concentrations of uranium in the ground, enjoy some of the [lowest cancer rates](#) in the U.S.

Even relatively high doses of radiation cause far less harm than most people think. Careful, large, and long-term studies of survivors of the atomic bombings of Hiroshima and Nagasaki offer compelling demonstration.

Cancer rates were [just 10 percent higher](#) among atomic blast survivors, most of whom never got cancer. Even those who received a dose 1,000 times higher than today's safety limit saw their lives cut short by an average of 16 months.

But didn't the Japanese government recently award a financial settlement to the family of a Fukushima worker who claimed his cancer was from the accident?

It did, but for reasons that were [clearly political](#), and having to do with the Japanese government's consensus-based, conflict-averse style, as well as lingering guilt felt by elite policymakers toward Fukushima workers and residents, who felt doubly aggrieved by the tsunami and meltdowns.

The worker's cancer was highly unlikely to have come from Fukushima because, once again, the level of radiation workers received was far lower than the ones received by the Hiroshima/Nagasaki cohort that saw (modestly) higher cancer rates.

What about Three Mile Island? After the accident in 1979, *Time Magazine* ran a cover story that superimposed a glowing headline, "Nuclear Nightmare," over an image of the plant. *Nightmare?* More like a dream. What other major industrial technology can suffer a catastrophic failure and not kill anyone?

Remember when the Deepwater Horizon oil drilling rig caught on fire and **killed 11** people? Four months later, a Pacific Gas & Electric natural gas pipeline exploded just south of San Francisco and **killed eight** people sleeping in their beds. And that was just one year, 2010.

The worst energy accident of all time was the 1975 collapse of the Banqiao hydroelectric dam in China. It collapsed and killed between **170,000 and 230,000 people**.

Nuclear's worst accidents show that the technology has always been safe for the same, inherent reason that it has always had such a small environmental impact: the high energy density of its fuel.

Splitting atoms to create heat, rather than splitting chemical bonds through fire, requires tiny amounts of fuel. A single Coke can of uranium can provide enough energy for an entire high-energy life.

When the worst occurs, and the fuel melts, the amount of particulate matter that escapes from the plant is insignificant in contrast to both the fiery explosions of fossil fuels and the daily emission of particulate matter from fossil- and biomass-burning homes, cars, and power plants, which **kill seven million people a year**.

Thanks to nuclear's inherent safety, the best-available science shows that **nuclear has saved at least two million lives to date by preventing the burning of biomass and fossil fuels. Replacing, or not building, nuclear plants, thus results in more death.**

In that sense, Fukushima did result in a public health catastrophe. Only it wasn't one created by the tiny amounts of radiation that escaped from the plant.

Anxiety Displacement and Panic

The Japanese government, in the view of Chernobyl expert Geraldine Thomas and other radiation experts, contributed to the widespread view of radiation as a super-potent toxin by failing to return residents to the Fukushima province after the accident, and for reducing radiation in soil and water to unnecessarily low levels.

The problem started with an over-evacuation. Sixty-thousand people were evacuated but only 30,000 have returned. While some amount of temporary evacuation might have been justified, there was simply never any reason for such a large, and long-term, evacuation.

About 2,000 people died from the evacuation, while others who were displaced suffered from loneliness, depression, suicide, bullying at school, and anxiety.

"With hindsight, we can say the evacuation was a mistake," **said** Philip Thomas, a professor of risk management at the University of Bristol and leader of a recent research project on nuclear accidents. **"We would have recommended that nobody be evacuated."**

Beyond the evacuation was the government's massively exaggerated clean-up of the soil. To give you a sense of how exaggerated the clean-up was, consider that **the Colorado plateau was and is more (naturally) radioactive than most of Fukushima after the accident.**

"There are areas of the world that are more radioactive than Colorado and the inhabitants there do not show increased rates of cancer," notes Dr. Thomas. And whereas radiation levels at Fukushima

decline rapidly, "those areas stay high over a lifetime as the radiation is not the result of contamination but of natural background radiation."

Even residents living in the areas with the highest levels of soil contamination were unaffected by the radiation, according to a major study of nearly 8,000 residents in the two to three years since the accident.

In 2017, while visiting Fukushima for the second time, I lost my cool over this issue. Jet-lagged and hungry, and witnessing the ridiculous and expensive bull-dozing of the region's fertile topsoil into green plastic bags, I started grilling a scientist with the ministry of the environment.

Why were they destroying Fukushima's precious topsoil in order to reduce radiation levels that were already at levels far lower than posed a danger? Why was the government spending billions trying to do the same thing with water near the plant itself? Was nobody in Japan familiar with mainstream radiation health science?

At first the government scientist responded by simply repeating the official line — they were remediating the top soil to remove the radiation from the accident.

I decided to force the issue. I repeated my question. My translator told me that the expert didn't understand my question. I started arguing with my translator.

Then, at that moment, the government scientist started talking again. I could tell by the tone of his voice that he was saying something different.

"Every scientist and radiation expert in the world who comes here says the same thing," he said. "We know we don't need to reduce radiation levels for public health. We're doing it because the people want us to."

The truth of the matter had been acknowledged, and the tension that had hung between us had finally broken. "*Arigato gozaimasu!*" I said, genuinely grateful for the man's honesty.

The man's face was sad when he explained the situation, but he was also calmer. The mania behind his insistence that the "contaminated" topsoil had required "cleaning" had evaporated.

And I wasn't mad anymore either, just relieved. I understood his dilemma. He had only been the repeating official dogma because his job, and the larger culture and politics, required him to.

Such has been the treatment of radiation fears by scientists and government officials, not just in Japan, for over 60 years.

There is no evidence that low levels of radiation hurt people, but rather than be blunt about that, scientists have, in the past, shaded the truth often out of a misguided sense of erring on the side of caution, but thereby allowing widespread misunderstanding of radiation to persist.

We also now know that when societies don't use nuclear, they mostly use fossil fuels, not renewables. After Fukushima, Japan closed its nuclear plants and saw deadly air pollution skyrocket.

The biggest losers, as per usual, are the most vulnerable: those with respiratory diseases, such as emphysema and asthma, children, the elderly, the sick, and the poor, who tend to live in the most polluted areas of cities.

It's also clear that people displace anxieties about other things onto nuclear accidents. **We know from in-depth qualitative research conducted in the 1970s that young people in the early part of that decade were displacing fears of nuclear bombs onto nuclear plants.**

Nuclear plants are viewed as little bombs and nuclear accidents are viewed as little atomic explosions, complete with fall-out and the dread of contamination.

It is impossible to view the Japanese public's panicked overreaction to Fukushima and not see it as partly motivated by the horror of having seen 15,897 citizens instantly killed, and another 2,533 gone missing, after a tsunami hammered the region.

The sociologist Kyle Cleveland argues persuasively that Fukushima was a "moral panic," in that the panic was motivated by a desire by the Japanese news media and public for revenge against an industrial and technical elite viewed as uncaring, arrogant, and corrupt.

Seeing Opportunity In Fear

After Fukushima, investors poured millions into so-called "advanced nuclear" start-up companies proposing to use chemicals, metals, or gases instead of water for cooling the uranium or thorium fuels in nuclear plants.

Often, they inadvertently reinforced the worst of the public's fears. It's one thing when anti-nuclear activists fear-monger about Fukushima, it's quite another when supposedly pro-nuclear advocates do so.

Worse, the notion that one could look at the *design* of a nuclear plant and declare it safer than existing nuclear plants is *transcience* at best, pseudoscience at worst.

To compare the relative safety of different kinds of nuclear reactors one would need decades of operational data, which don't exist for non-existent designs. And even then, one would likely need a lot more accidents and deaths to tease out any kind of correlation.

When pressed as to supposed safety advantages, advocates of radical innovation in nuclear often slip into claiming that this or that design will be far cheaper than today's designs.

But the *cheapest nuclear* is the kind that humans have the most experience building, operating, and regulating. Slow, conservative, and incremental innovation is what has made nuclear plants cheaper, while radical innovation has made it more expensive.

Was anything better for the U.S. nuclear industry than Three Mile Island? Not a single nuclear industry executive would have said so at the time. But in the decades since, many of them came to believe precisely that.

In response to Three Mile Island, the nuclear industry stepped up training, checklists, and better oversight. The result was that nuclear plants in the U.S. went from operating at 55 percent to over 90 percent of the time.

Anti-nuclear activists have long claimed that there is a trade-off between nuclear safety and economics when it comes to the operation of plants, when in reality the opposite is the case. With improved performance came far higher income from electricity sales.

Might Japanese nuclear leaders look back on Fukushima the same way one day? That depends on what they do now.

To date, Japanese leaders have tried to make amends to the public for the Fukushima accident, but they've done so in ways that have reinforced the view of radiation as a super-potent toxin, and without building any greater trust in the technology.

For decades, nuclear leaders in Japan and the U.S. reinforced the notion that nuclear is an inherently dangerous technology, but *one that they could control*. When it became clear that they couldn't control it, the public understandably assumed that they had been put in danger.

The truth is, in part, more reassuring. The radiant particulate matter that escapes from the worst nuclear accidents isn't all that dangerous because there isn't all that much of it.

But another lesson is that humans are never in absolute control of our technologies. If we were, then nobody would die from exploding natural gas pipelines, plane crashes, or collapsed hydroelectric dams.

The question is not how humans can gain absolute mastery, since that's impossible, but rather which machines, on balance, deliver the most good with the least harm. On that metric, nuclear power has always been, inherently, the safest way to power civilization.

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I am a Time Magazine "Hero of the Environment," Green Book Award Winner, and President of Environmental Progress, a research and policy organization. My writings have appeared in The New York Times, Washington Post and Wall Street Journal, Scientific American, Nature Energy, and PLOS Biology. My TED talks have been viewed over 1.5 million times.