

# Nuclear Energy

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*Version 1.4 (posted on 1 March 2022)  
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Of all the incredibly stupid decisions made by America and modern civilization over my lifetime — and there have been far too many to list here — the choice to build and use massive nuclear fission reactors as a way to produce electricity is right near the top of the list.

The accidents at Three-Mile Island (in 1979), Chernobyl (in 1986), and then Fukushima (in 2011) are more than sufficient — essentially all we should ever need to know — to demonstrate without any lingering doubts the complete insanity of nuclear power plants. The three incidents mentioned are not mere cautionary tales. Instead, they represent inevitable and damning indictments, concrete proof of our willful derangement. I understand that, having made the decision and invested billions of dollars to build nuclear power plants, admitting that we were wrong is difficult, but denying our mistake and continuing down the same deadly road is more than foolish. It's lunacy.

This commentary is not a calm and thoughtful documentation of the history of nuclear power from the 1950s on. That story is easily accessible online, and I don't wish to even attempt to boil it down to one or two pages here. No, this commentary is a rant, a screed, an anguished cry in the night to protest yet again one particular example of outrageous human folly that is so arrogant, dangerous, and wrong-headed as to constitute nearly ultimate madness. In the poetry of narrative story-telling, our decision to turn to nuclear energy as a means of realizing our insatiable desire for ever-more power implies any number of disturbing qualities about our species, two of which stand out as fabled truisms: First, that humanity is apparently possessed by demons, and second, that our species seems to suffer from a death-wish so perversely potent that it defies belief.

Despite all the rhetoric from the 1950s about "*unlocking the power contained within the atom for the benefit of humanity*," that power isn't the direct source we use to make electricity. Nope, nothing so high-tech or alchemically magical. Producing (or generating) electricity for industrial and home use is about as low-tech as it gets. Mostly, it's done by turbine-driven generators through the relatively simple process of converting mechanical energy (motion) into electrical energy (current).

A rotor with blades is connected to a shaft within the turbine to which are attached powerful electro-magnets. The shaft is surrounded by a cylinder (called a “stator”) containing coils of insulated copper wire. The rotor blades and the shaft are turned by the force of a passing fluid, spinning the magnets. This motion “induces” a magnetic field around the shaft, causing electrons within the stationary coils to break off from their atoms and flow as current through the generator’s output wires. Voilà! Electricity.

The question then becomes: *How shall we turn the rotor blades to spin the shaft?* Any number of methods can accomplish this. We can use water wheels that are powered by the currents of rivers and streams. We can use wind-driven turbines to do the same thing. Far and away, the most popular method to accomplish large-scale generation of electricity is with steam turbines, by directing pressurized steam from boiling water past rotor blades, which then spin the shaft or axle to which the blades are attached. OK, great.

That leads us to another question, though: *How shall we heat the water?* What fuel shall we use to build the fire that then boils the water in the kettle to make the steam? We could (and do) use solar and geothermal energy to do this, but these methods account for only 4% of our electrical generation. We can also burn just about anything — wood, oil, coal, or natural gas. Throughout much of the past century, natural gas and coal-fired power plants were the primary fuels of choice. They still are, since they account for 60% of the electricity we produce.

All fossil fuels have downsides, however. Burning wood and coal in large quantities releases too much carbon into the atmosphere. Not good. And though we probably won’t run out of fossil fuels, over time they will become more and more difficult to extract from the earth, and thus expensive to acquire. Modern industrial civilization was made possible by the one-time bonanza of dirt-cheap fossil fuels, mainly oil and natural gas. When producing electricity becomes too expensive, as it will eventually with all fossil fuels, then the entire economic system of commerce grinds to a halt incredibly quickly.

This is one reason that we seem unwilling to even consider the seemingly sane response of cutting back on our energy use. The complex systems of industry and commerce that we’ve built may seem robust, but they work only at full speed. Reduce the pace even a little — turning down the volume, as it were — and they will collapse. Or so we’re told.

Another reason is that human beings tend to favor more over less. Having become habituated — in essence, addicted — to our high-energy societies and all they produce, we are loathe to even consider giving up some of that and making do with less.

So, in that devilish and cunningly ingenious way that human beings possess, some people thought, *"Let's use atoms to heat the water. We'll never run out of atoms. They're infinite, everywhere, and basically free. And we can mine more than enough Uranium to use as fuel for nuclear fission to last us for thousands of years. That will give us infinite energy, more than we will ever need. Problem solved!"*

Well, not quite. Smashing atoms to heat water to make steam to turn turbines to generate electricity has one serious downside: The uranium fuel rods we use in nuclear fission release as a by-product radioactivity that is lethal and doesn't dissipate quickly. Exposure to this radioactivity in even relatively small amounts destroys genetic function in living cells, which is the basis of most life on earth, including us. A high exposure dose can kill a person in days, and even a low dose is likely to result in cancer within decades.

Once released, the radioactivity lingers in the spent fuel rods not just for years or centuries, but for an almost inconceivable period of time. The half-life of radioactive decay for spent nuclear fuel is like 50,000 years. This means that after 50 millennia, the radioactivity is still half of what it was at the beginning, and it may remain lethal far past that, for another 50,000 years (or more).

The proponents of nuclear power tell us, *"No problem. We can make it safe. We know how to insulate the fuel rods in sturdy containers that will prevent their radioactivity from ever being released into the atmosphere. We'll build in multiple layers of safety redundancy — backups upon backups upon backups. Easy-peasy-Japanesey. Let's do it!"*

Unfortunately, these techno-industrial evangelists and dreamers who were so confident in our skills failed to factor in one small detail: human fallibility.

The problem here is that 99% competence is not enough to make this plan work without disaster. We need absolute perfection — 100% fail-safe, and we need that perfection to be permanent, almost literally forever. Despite our cleverness, ingenuity, and best intentions, human beings simply cannot pull off 100% perfection forever in anything. Sometimes we can get real close for a day or a week or even years in some endeavor (after all, we sent men to the moon and brought them home successfully), but 100% perfection forever? Nope. Not possible. Either we cut corners somewhere in the building process and lie about it, setting us up for some awful breakdown, or we fail to factor in every possible dangerous eventuality, and one day down the road the shit hits the fan and pulls the rug out from under us all at once. Oops. Sorry.

99% is good enough for lots of stuff — cars, refrigerators, even buildings. We can live with the 1% oops and sorry crap when most things go wrong. With radioactivity, however, even 1/1000th of 1% oops and sorry aren't good enough. We cannot make this absurd scheme safe without the inevitability of massive

danger to humanity and life on earth. Any comforting assurances to the public that we can are not only false, but astonishing and appalling. They're not just the ordinary, garden-variety lies and false promises that go with so much of profit-driven advertising. They are monstrous — murderous on an inconceivable scale.

Like children, we don't possess the good sense not to play with fire that can kill us. It's fucking stupid and tragic. Disaster is guaranteed to happen with nuclear energy. It already has. The only question is how bad will future catastrophes be?

So far, we've been lucky. Even as bad as Chernobyl was, and as terrible as Fukushima continues to be even 10 years after the earthquake and tsunami that caused that nuclear plant to fail, we haven't yet taken out an entire continent or killed tens of millions of people in a "nuclear accident." But there's no guarantee that it won't happen at some point.

I could write this same essay a second time just by substituting the phrase "nuclear weapons" for "nuclear energy" and changing the text a little. And I could write it a third time by substituting "Artificial Intelligence."

Apparently, we are unable or refuse to learn from our mistakes. Needless to say, this is beyond just being very sad and goes all the way to lethal criminality. And yet, too many people in positions of power and influence are so attached to the status quo and maintaining business-as-usual that even now, after numerous disasters and many more near-disasters, they continue to tell themselves and the public that nuclear power is a good idea.

It's not. In the pantheon of really bad human ideas, nuclear energy stands out as one of the very worst ideas ever, truly a deal with the devil.