

# Fukushima and the Future of Nuclear Power

There's no evidence that low doses of radiation are harmful and no reason to paralyze our economy out of fear of nuclear power.

By **WILLIAM TUCKER**

In the early 1980s, a Taiwan steel company accidentally mixed some highly radioactive cobalt-60 into a batch of steel rebar. The radioactive rods were then used in the construction of 1,700 apartments. As a result, people living in these buildings were subject to radiation up to 30 times the normal amount received from the natural background.

When dismayed officials discovered this enormous error 15 years later, they surveyed past and present apartment dwellers expecting to find an epidemic of cancer. Normal incidence would have predicted 160 cancers among the 10,000 residents. To their astonishment, the researchers discovered only five cases of cancer—97% lower than the anticipated amount. Birth defects were also 94% below the anticipated rate. These findings were published in the *Journal of American Physicians and Surgeons* in 2004. As one researcher phrased it, exposure to high levels of background radiation had apparently bestowed upon residents "an effective immunity from cancer."

The incident illustrates the enormous gap that has grown between radiation science and the popular perception of the dangers of nuclear power. One year after Japan's Fukushima accident, much of the world is running away from nuclear energy on the grounds that its risks are too great for a modern society to bear.

Germany has reinstated plans to close down all its reactors by 2022, even if it means importing huge quantities of natural gas from Russia and nuclear-generated electricity from France and the Czech Republic. Japan has taken all of its 54 reactors out of service with the possibility that they may never run again. The result has been a complete reversal of Japan's trade balance from 20 years of surpluses to a record \$18 billion deficit. Oil and liquid natural gas imports have increased dramatically while factories have slowed because of power shortages.

In the United States, the reaction so far has been less severe. The Nuclear Regulatory Commission has increased its vigilance and is under tremendous pressure to close down aging reactors such as Vermont Yankee in southeastern Vermont and Indian Point north of New York City. But the NRC did issue its first new license in 30 years for two Westinghouse AP1000 reactors at the Vogtle plant in eastern Georgia. Construction is expected to begin soon. Still, it's a far cry from the 30 to 100 new reactors that were being touted a year ago as part of America's "nuclear renaissance."

Meanwhile, 100 coal plants have been shut down in the U.S. over concerns about mercury and carbon emissions while the "renewables," solar and wind, that are supposed to take their place are proving to

be much more intractable and land-consuming than previously imagined. With so much economic damage in the wake of Fukushima, it might behoove the world to ponder what the dangers of nuclear energy really are.

All 54 of Japan's reactors absorbed an earthquake of 9.0 on the Richter scale—the biggest in Japan's recorded history. Though the shock exceeded design specifications, the steel reactor vessels and concrete containment structures remained intact. The problem occurred when the subsequent 50-foot tsunami wiped out the backup generators at Fukushima, crippling the cooling system and causing the four operating reactors to overheat.

The core of three reactors melted down, but that in itself is not a public catastrophe as long as the reactor vessel and containment structure hold. All the radiation releases have come from contaminated cooling water and steam vented or escaping into the environment. Other releases came from the spent fuel pools, which also lost some of their coolant and proved to be a greater danger.

Nuclear engineers have long recognized these vulnerabilities. The AP1000 being built in Georgia is specifically designed with a "passive" cooling system that relies on natural convection currents rather than electric pumps so the reactors can cool themselves for several days while waiting for power to be restored. Spent fuel rods at existing reactors will be moved inside the containment structure wherever possible or into dry casks where they do not require cooling. All this takes time and expense but will be a necessary step toward improving nuclear safety.

The real problem, however, may be in the public's overestimation of the danger posed by small exposures to radiation. In order to avoid any possible charge of negligence, regulatory bodies around the world have adopted what is called a "linear-no-threshold" or "no safe dose" standard for radiation safety.

This says, quite simply, that because huge doses of radiation—the kind you might get from standing in the same room with a spent fuel rod—can cause illness or cancer, we must assume that even the smallest doses will have the same effect on a smaller scale. It's exactly the same as saying that because jumping off a 10-story building will break every bone in your body, stepping off a one-foot curb will also cause some minor damage.

So far there have been zero fatalities or adverse health effects from radiation exposure at Fukushima. All the damage has been from depression, despair and even suicide among the 100,000 people who have been evacuated from their homes within a 12-mile radius.

Some of these people are even being shunned in their new locales under the bizarre supposition that they constitute a radioactive danger. Yet as Ted Rockwell, one of the most notable veterans of the Manhattan Project, points out, people around the world live with radiation levels much higher than is present in the evacuation zone without showing any ill effects. The residents of the Taiwan apartments experienced 10 times the level of radiation as is prevalent in the evacuation zone.

The etiology of radiation-related disease is well-known. Radiation can cause DNA damage but the body has repair mechanisms to deal with it. Last December scientists at Berkeley made microscopic videotapes of these cellular repair sites in action. "Our data show that at lower doses of ionizing radiation, DNA repair mechanisms work much better than at higher doses," wrote Mina Bissell, a

world-renowned breast cancer researcher who co-authored the report. "This non-linear DNA damage response casts doubt on the general assumption that any amount of ionizing radiation is harmful and additive."

Other researchers speculate that low radiation doses may immunize the body against cancer and birth defects by stimulating these repair mechanisms into greater responsiveness, just as vaccines stimulate the immune system. That would explain the low cancer rates in Taiwan.

As long as government agencies around the world continue to operate under the premise that even the smallest exposures to ionizing radiation can be harmful, Germany and Japan will go on dismembering their economies while countries such as the U.S. attempt to straddle the widening gap between outlawed coal and a renewables future whose promise now appears greatly exaggerated.

Taking a clear-eyed look at the actual dangers of nuclear energy seems like a much more sensible course.

Mr. Tucker is author of "Terrestrial Energy: How Nuclear Power Will Lead the Green Revolution and End America's Energy Odyssey" (Bartleby Press, 2010).