

A Warming World: No to Nukes

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It's tempting to turn to nuclear plants to combat climate change, but alternatives are safer and cheaper.

Japan sees nuclear power as a solution to global warming, but it's paying a price. Last week, a magnitude 6.8 earthquake caused dozens of problems at the world's biggest nuclear plant, leading to releases of radioactive elements into the air and ocean and an indefinite shutdown. Government and company officials initially downplayed the incident and stuck to the official line that the country's nuclear plants are earthquake-proof, but they gave way in the face of overwhelming evidence to the contrary. Japan has a sordid history of serious nuclear accidents or spills followed by cover-ups.

It isn't alone. The U.S. government allows nuclear plants to operate under a level of secrecy usually reserved for the national security apparatus. Last year, for example, about nine gallons of highly enriched uranium spilled at a processing plant in Tennessee, forming a puddle a few feet from an elevator shaft. Had it dripped into the shaft, it might have formed a critical mass sufficient for a chain reaction, releasing enough radiation to kill or burn workers nearby. A report on the accident from the Nuclear Regulatory Commission was hidden from the public, and only came to light because one of the commissioners wrote a memo on it that became part of the public record.

The dream that nuclear power would turn atomic fission into a force for good rather than destruction unraveled with the Three Mile Island disaster in 1979 and the Chernobyl meltdown in 1986. No U.S. utility has ordered a new nuclear plant since 1978 (that order was later canceled), and until recently it seemed none ever would. But rising natural gas prices and worries about global warming have put the nuclear industry back on track. Many respected academics and environmentalists argue that nuclear power must be part of any solution to climate change because nuclear power plants don't release greenhouse gases.

They make a weak case. The enormous cost of building nuclear plants, the reluctance of investors to fund them, community opposition and an endless controversy over what to do with the waste ensure that ramping up the nuclear infrastructure will be a slow process - far too slow to make a difference on global warming. That's just as well, because nuclear power is extremely risky. What's more,

there are cleaner, cheaper, faster alternatives that come with none of the risks.

Glowing Pains

Modern nuclear plants are much safer than the Soviet-era monstrosity at Chernobyl. But accidents can and frequently do happen. The Union of Concerned Scientists cites 51 cases at 41 U.S. nuclear plants in which reactors have been shut down for more than a year as evidence of serious and widespread safety problems.

Nuclear plants are also considered attractive terrorist targets, though that risk too has been reduced. Provisions in the 2005 energy bill required threat assessments at nuclear plants and background checks on workers. What hasn't improved much is the risk of spills or even meltdowns in the event of natural disasters such as earthquakes, making it mystifying why anyone would consider building reactors in seismically unstable places like Japan (or California, which has two, one at San Onofre and the other in Morro Bay).

Weapons proliferation is an even more serious concern. The uranium used in nuclear reactors isn't concentrated enough for anything but a dirty bomb, but the same labs that enrich uranium for nuclear fuel can be used to create weapons-grade uranium. Thus any country, such as Iran, that pursues uranium enrichment for nuclear power might also be building a bomb factory. It would be more than a little hypocritical for the U.S. to expand its own nuclear power capacity while forbidding countries it doesn't like from doing the same.

The risks increase when spent fuel is recycled. Five countries reprocess their spent nuclear fuel, and the Bush administration is pushing strongly to do the same in the U.S. Reprocessing involves separating plutonium from other materials to create new fuel. Plutonium is an excellent bomb material, and it's much easier to steal than enriched uranium. Spent fuel is so radioactive that it would burn a prospective thief to death, while plutonium could be carried out of a processing center in one's pocket. In Japan, 200 kilograms of plutonium from a waste recycling plant have gone missing; in Britain, 30 kilograms can't be accounted for. These have been officially dismissed as clerical errors, but the nuclear industry has never been noted for its truthfulness or transparency. The bomb dropped on Nagasaki contained six kilograms.

Technology might be able to solve the recycling problem, but the question of what to do with the waste defies answers. Even the recycling process leaves behind highly radioactive waste that has to be disposed of. This isn't a temporary issue: Nuclear waste remains hazardous for tens of thousands of years. The only way to get rid of it is to put it in containers and bury it deep underground - and pray that geological shifts or excavations by future generations that have forgotten where it's buried don't unleash it on the surface.

No country in the world has yet built a permanent underground waste repository, though Finland has come the closest. In the U.S., Congress has been struggling for decades to build a dump at Yucca Mountain in Nevada but has been unable to overcome fierce local opposition. One can hardly blame the Nevadans. Not many people would want 70,000 metric tons of nuclear waste buried in their neighborhood or transported through it on the way to the dump.

The result is that nuclear waste is stored on-site at the power plants, increasing the risk of leaks and the danger to plant workers. Eventually, we'll run out of space for it.

Goin' Fission?

Given the drawbacks, it's surprising that anybody would seriously consider a nuclear renaissance. But interest is surging; the NRC expects applications for up to 28 new reactors in the next two years. Even California, which has a 31-year-old ban on construction of nuclear plants, is looking into it. Last month, the state Energy Commission held a hearing on nuclear power, and a group of Fresno businessmen plans a ballot measure to assess voter interest in rescinding the state's ban.

Behind all this is a perception that nuclear power is needed to help fight climate change. But there's little chance that nuclear plants could be built quickly enough to make much difference. The existing 104 nuclear plants in the U.S., which supply roughly 20% of the nation's electricity, are old and nearing the end of their useful lives. Just to replace them would require building a new reactor every four or five months for the next 40 years. To significantly increase the nation's nuclear capacity would require far more.

The average nuclear plant is estimated to cost about \$4 billion. Because of the risks involved, there is scarce interest among investors in putting up the needed capital. Nor have tax incentives and subsidies been enough to lure them. In part, that's because the regulatory process for new plants is glacially slow. The newest nuclear plant in the U.S. opened in 1996, after having been ordered in 1970 - a 26-year gap. Though a carbon tax or carbon trading might someday make the economics of nuclear power more attractive, and the NRC has taken steps to speed its assessments, community opposition remains high, and it could still take more than a decade to get a plant built.

Meanwhile, a 2006 study by the Institute for Energy and Environmental Research found that for nuclear power to play a meaningful role in cutting greenhouse gas emissions, the world would need to build a new plant every one to two weeks until mid-century. Even if that were feasible, it would overwhelm the handful of companies that make specialized parts for nuclear plants, sending costs through the roof.

The accelerating threat of global warming requires innovation and may demand risk-taking, but there are better options than nuclear power. A combination of energy-efficiency measures, renewable power like wind and solar, and decentralized power generators are already producing more energy worldwide than nuclear power plants. Their use is expanding more quickly, and the decentralized approach they represent is more attractive on several levels. One fast-growing technology allows commercial buildings or complexes, such as schools, hospitals, hotels or offices, to generate their own electricity and hot water with micro-turbines fueled by natural gas or even biofuel, much more efficiently than utilities can do it and with far lower emissions.

The potential for wind power alone is nearly limitless and, according to a May report by research firm Standard & Poor's, it's cheaper to produce than nuclear power. Further, the amount of electricity that could be generated simply by making existing non-nuclear power plants more efficient is staggering. On average, coal plants operate at 30% efficiency worldwide, but newer plants operate at 46%. If the world average could be raised to 42%, it would save the same amount of carbon as building 800 nuclear plants.

Nevertheless, the U.S. government spends more on nuclear power than it does on renewables and efficiency. Taxpayer subsidies to the nuclear industry amounted to \$9 billion 2006, according to Doug Koplou, a researcher based in Cambridge, Mass., whose Earth Track consultancy monitors energy spending. Renewable power sources, including hydropower but not ethanol, got \$6 billion, and \$2 billion went toward conservation.

That's out of whack. Some countries - notably France, which gets nearly 80% of its power from nuclear plants and has never had a major accident - have made nuclear energy work, but at a high cost. The state-owned French power monopoly is severely indebted, and although France recycles its waste, it is no closer than the U.S. to approving a permanent repository. Tax dollars are better spent on windmills than on cooling towers.

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