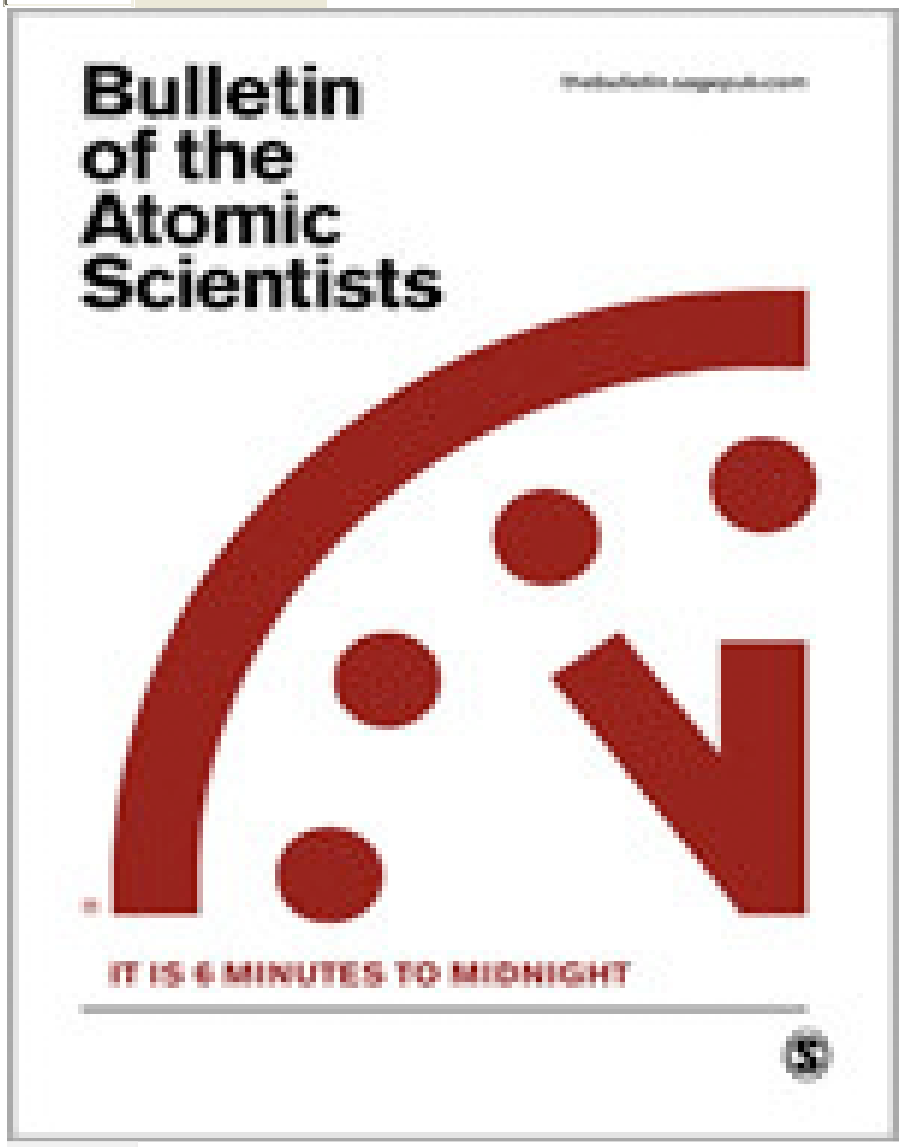

Roundtables

Is nuclear energy different than other energy sources?

Cheaper, safer alternatives than nuclear fission

Kristin Shrader-Frechette
19 August 2011

If reactors were safe, nuclear industries would not demand government-guaranteed, accident-liability protection, as a condition for their generating electricity. Escaping from liability is one of many differences between atomic power and renewable-energy sources. Given the need to curb greenhouse-gas emissions and avoid fossil fuels, comparing nuclear power with renewable alternatives is urgent. What are their differences? If one considers liability, cost, emissions, environmental justice, and weapons proliferation, renewables such as wind and solar-photovoltaic clearly are safer, cheaper, more climate friendly, more ethical, and less vulnerable to terrorism than nuclear fission.

The liability difference. Unlike renewable-energy technologies, by law (the Price-Anderson Act) US reactor operators are not liable for 98 percent of major, government-calculated, nuclear-accident damages. Worldwide, most reactor operators have no liability for accidents. Why? Many reactor programs (including those in the United States) began because governments sought nuclear-weapons-grade materials or technologies and, to get them, agreed to the industry demand for avoiding most liability. The public, not industry, thus bears most nuclear risks and costs, even those caused by negligence or illegal activities. Yet, government studies say there is a one-in-five chance that at least one of the 104 US reactors will have a core-melt accident in its lifetime -- and that such an accident could kill 140,000 people and permanently contaminate an area the size of Pennsylvania. Renewables like wind and solar, however, enjoy no legally mandated avoidance of liability.

Why does the nuclear industry tell the public that reactors are safe, when its own liability demands prove the opposite? Markets and credit-rating agencies provide one answer: Purchasing market-based, accident-liability-insurance coverage would triple fission-electricity prices.

Why impose nuclear costs, risks, and liabilities on innocent victims when renewable technologies will work? The classic Princeton study in *Science* shows any six of at least nine renewable/efficiency technologies, "already deployed at an industrial scale," could solve global climate problems by 2050. Government says that wind from only three states (Kansas, North Dakota, and Texas) could supply all US electricity; that by 2015 to 2018, solar-photovoltaic will have grid parity and be cost-competitive with all electricity sources; that solar-thermal already is fully competitive; but that by 2030, fission could provide, at most, only 57 percent as much US energy as renewables.

The cost difference. Because commercial fission has been much more heavily subsidized than renewable energy, it is artificially protected from markets -- from real prices that are much higher than those of renewables. Why the subsidies? Partly because governments seek military-nuclear-technology advantages from civilian reactors, they subsidize 50 to 90 percent of commercial-fission costs. No reactors anywhere have ever begun or operated on the market.

During the last 50 years, according to MRG Consultants, the United States has provided 33 times more subsidies ($165 billion) to commercial nuclear than to wind and solar combined ($5 billion), if one counts only direct subsidies and three indirect subsidies (for construction incentives, liability, and tax credits). Counting all direct and indirect subsidies, US commercial-fission subsidies have been 200 times greater ($20 billion annually or $1 trillion over 50 years) than those for wind and solar combined, according to the late MIT Nobelist Henry Kendall. Although the Obama administration has proposed another $54 billion in commercial-reactor subsidies, to generate new-reactor proposals, no US reactors have been ordered since 1974. Why not?

Even massive subsidies -- necessary for utilities to consider building reactors -- are insufficient to make fission economical. Investors and banks agree, refusing nuclear loans. A *Forbes* article calls nuclear power "the largest managerial disaster in business history," pursued only by the "blind" or the "biased." Credit-rating agencies, such as Moody's and Standard and Poor's, agree, downgrading utilities with reactors. They know that wind supplies significant amounts of power for many Midwestern states and that Iowa, for example, uses wind for 20 percent of electricity. Installed US wind is above 40,000 megawatts and rapidly increasing, but dropping in cost, while installed US fission is below 101,000 megawatts and rapidly decreasing, but increasing in cost. Credit-rating agencies say market-based nuclear costs are 15 cents per kilowatt-hour and rapidly rising, despite massive, lopsided subsidies, while the US government says median, market-based, wind costs are nearly five times lower -- 3.4 cents per kilowatt-hour, often dropping to 1 to 2 cents per kilowatt-hour.

The Union of Concerned Scientists says commercial-nuclear subsidies, over 50 years, have been so large -- in proportion to energy-production values -- that often it would have cost taxpayers less to simply buy electricity on the open market and give it away. As physicist Amory Lovins notes, fission died of an acute attack of market forces. Subsidizing it is like defibrillating a corpse; it will jump but remain dead. The International Energy Agency agrees: High costs have destroyed fission, and by 2030 or sooner, it will supply only 9 percent -- not its current 14 percent -- of global electricity.

Globally, fission has 375 gigawatts installed and is declining, while by 2013, BTM Consultants says that wind will have 340 gigawatts installed, with continuing explosive growth. In the European Union, wind is growing faster than any other energy installations, and the American Wind Energy Association says that, since 2007, wind has added twice the new capacity of coal and nuclear combined. OffshoreWind.biz says that more than half of the new global-wind installations were added outside Europe and North America. For years, Germany, Spain, and India each have annually added more wind than the world added in fission. The Danes use wind to generate 21 percent of electricity; by 2030, it will generate half. By 2020, the EU says renewables will generate 20 to 49 percent of EU energy, depending on the nation.

Why are most banks, credit-rating agencies, investors, and nations promoting renewable energy, while the United States continues to subsidize nuclear power more than renewables? The *Economist* blames US nuclear-industry campaign contributions, encouraging politicians to do what bankers and investors refuse to do.

The emissions difference. Multiple independent, university-based analyses, from Oxford (United Kingdom) to Heerlen (Netherlands) to Singapore, agree about per-kilowatt-hour, carbon-equivalent, full-fuel-cycle emissions: Once all emissions are counted, fission is five to 40 times dirtier than wind, three to 10 times dirtier than solar-photovoltaic, and roughly as dirty as natural gas (although credit-rating agencies say natural gas is three times cheaper than fission). Most people are unaware of this emissions difference because nuclear-industry-funded PR "trims the data" -- including only reactor releases but ignoring full-nuclear-fuel-cycle carbon emissions from processes such as uranium mining, milling, conversion, enrichment, fabrication, reprocessing, storage, and transport. Even pro-nuclear MIT and government studies erroneously "trim" carbon data, calling fission "carbon free," or "emissions free." Such trimming of renewable-energy costs and emissions is less likely, especially in the United States, partly because the Office of Management and Budget and the American Recovery and Reinvestment Act make clean-energy funding contingent on detailed reporting, transparency, accountability, and performance requirements.

The environmental-justice difference. Fission imposes more health-and-safety burdens on children, minorities, poor people, and future generations than does renewable energy. Well-confirmed English, French, German, Scottish, US, and other scientific-journal studies show increased infant and childhood mortality and cancers within 30 miles of normally operating reactors. Such harms are inevitable because, although there is no safe dose of ionizing radiation, all nations allow each reactor to release at least 25 millirems of radiation annually, some countries allow up to 100 millirems, and yet children are up to 38 times more sensitive to radiation than adults.

Robust US statistical studies also show that reactors -- but not renewable-energy facilities -- tend to be located in poor or minority neighborhoods. Japan, for instance, places most reactors in impoverished areas. Using a system described as "bribery" and encouraging "addiction," Japan taxes all electricity consumers, then gives billions of dollars annually (up to three-fourths of local revenues) to poor communities that host reactors. Some host-community residents need not even work for a living.

Fission also places heavier burdens on future generations than does renewable energy. The US National Academy of Sciences says nuclear waste must be stored forever, yet the US government admits that current waste-protection standards cannot be met in the future. Perhaps Alvin Weinberg, former director of Oak Ridge Laboratories, was right: Nuclear waste is a Faustian bargain, exchanging future generations' safety for this generation's energy and military programs. Renewables, however, have fewer environmental-justice burdens, mainly because their generating facilities involve neither dirty fuel sources nor harmful emissions.

The weapons difference. Unlike renewables, fission encourages nuclear proliferation because the same technology can be used for arms manufacture. Many UN and US agencies warn that building more reactors unavoidably increases proliferation risks. Al Qaeda has targeted US reactors, and the National Academy of Sciences says US nuclear plants cannot withstand aircraft attacks -- which could cause 10 times more fatalities than the Chernobyl accident, up to 500 miles away.

Fission is different -- riskier, more expensive, more unjust, more proliferation-and-terrorist-prone, than renewable-energy sources such as solar and wind. These differences explain why banks, credit-raters, insurers, investors, and markets all agree. Economics, ethics, and safety all dictate the same choice: renewable energy.