

Nuclear bomb

search on 'price of nuclear power'

Nuclear energy, the sequel, is opening to raves by everybody from John McCain to a Greenpeace co-founder. Don't be fooled. It's the "Ishtar" of power generation.

By Joseph Romm

June 2, 2008 | No nuclear power plants have been ordered in this country for three decades. Once touted as "too cheap to meter," nuclear power simply became "too costly to matter," as the Economist put it back in May 2001.

Yet growing concern over greenhouse gas emissions from fossil fuel plants has created a surge of new interest in nuclear. Wired magazine just proclaimed "Go nuclear" on its cover. Environmentalists like Stewart Brand and James Lovelock have begun embracing nukes as a core climate solution. And GOP presidential nominee John McCain, who has called for building hundreds of new nuclear plants in this country, recently announced he won't bother showing up to vote on his friend Joe Lieberman's climate bill because of insufficient subsidies (read "pork") for nuclear power.

What do they know that scores of utility executives and the Economist don't? Nothing, actually. Nuclear power still has so many problems that unless the federal government shovels tens of billions of dollars more in subsidies to the industry, and then shoves it down the throat of U.S. utilities and the public with mandates, it is unlikely to see a significant renaissance in this country. Nor is nuclear power likely to make up even 10 percent of the solution to the climate problem globally.

Why? In a word, cost. Many other technologies can deliver more low-carbon power at far less cost. As a 2003 MIT study, "The Future of Nuclear Energy," concluded: "The prospects for nuclear energy as an option are limited" by many "unresolved problems," of which "high relative cost" is only one. Others include environment, safety and health issues, nuclear proliferation concerns, and the challenge of long-term waste management.

Since new nuclear power now costs more than double what the MIT report assumed -- three times what the Economist called "too costly to matter" -- let me focus solely on the unresolved problem of cost. While safety, proliferation and waste issues get most of the publicity, nuclear plants have become so expensive that cost overwhelms the other problems.

Already nuclear energy, the sequel, is a source of major confusion in the popular press. Consider this recent interview between Newsweek's Fareed Zakaria and Patrick Moore, one of the co-founders of Greenpeace, who is now a strong advocate for nuclear power. Zakaria asks, "A number of analyses say that nuclear power isn't cost competitive, and that without government subsidies, there's no real market for it." Moore replies:

That's simply not true. Where the massive government subsidies are is in wind and solar ... I know that the cost of production of electricity among the 104 nuclear plants operating in the United States is 1.68 cents per kilowatt-hour. That's not including the capital costs, but the cost of production of electricity from nuclear is very low, and competitive with dirty coal. Gas costs three times as much as nuclear, at least. Wind costs five times as much, and solar costs 10 times as much.

In short: That's absurd. Nuclear power, a mature industry providing 20 percent of U.S. power, has received some \$100 billion in U.S. subsidies -- more than three times the subsidies of wind and solar, even though they are both emerging industries. And how can one possibly ignore the capital costs of arguably the most capital-intensive form of energy? Moore's statement is like saying "My house is incredibly cheap to live in, if I don't include the mortgage."

Furthermore, after capital costs, wind power and solar power are pretty much free -- nobody charges for the breeze and the sun. Operation is also cheap, compared with nukes, which run on expensive uranium and must be monitored minute by minute so they don't melt down. Moore is talking about old nuclear plants, which have been paid off. But the price of new nuclear power has risen faster than any other form of power, as a detailed study of coal, gas, wind and nuclear power capital costs by Cambridge Energy Research Associates concluded.

In fact, from 2000 through October 2007, nuclear power plant construction costs -- mainly materials, labor and engineering -- have gone up 185 percent! That means a nuclear power plant that would have cost \$4 billion to build in 2000 would have cost more than \$11 billion to build last October.

You know an industry is starting to price itself out of business when one of its trade magazines, Nuclear Engineering International, headlines a recent article "How Much? For Some Utilities, the Capital Costs of a New Nuclear Power Plant Are Prohibitive."

As the article related, in 2005, the U.S. Energy Information Administration projected about \$2,000 per kilowatt for a nuclear plant's "overnight capital costs" -- the industry's rosy-eyed terminology for the cost of the plant if it could be built overnight, absent interest and financing costs, and assuming no construction cost overruns. At the time, Marvin Fertel, the chief nuclear officer at the Nuclear Energy Institute (NEI), told the Senate that the assumptions made on new nuclear plant construction were "unrealistically high and inflated."

But by mid-2007, a Keystone report, funded in part by the nuclear industry and NEI, estimated overnight costs at \$3,000 per kilowatt, which, with interest, equals \$3,600 to \$4,000 per kilowatt. The report notes, "The power isn't cheap: 8.3 to 11.1 cents per kilowatt hour." That's not cheap, when you consider that in December 2007, retail prices in this country averaged 8.9 cents per kilowatt-hour.

Mid-2007 had already become the good old days for affordable nuclear power. Jim Harding, who was on the Keystone Center panel and was responsible for its economic analysis, e-mailed me in May that his current "reasonable estimate for levelized cost range ... is 12 to 17 cents per kilowatt hour lifetime, and 1.7 times that number [20 to 29 cents per kilowatt-hour] in first year of commercial operation."

At the end of August 2007, American Electric Power CEO Michael Morris said that because of construction delays and high costs, the company wasn't planning to build any new nuclear plants. Also, builders would have to queue for certain parts and face "realistic" costs of about \$4,000 a kilowatt. "I'm not convinced we'll see a new nuclear station before probably the 2020 timeline," Morris said.

So much for being a near-term, cost-effective solution to our climate problem. But if \$4,000 per kilowatt was starting to price nuclear out of the marketplace, imagine what prices 50 percent to 100 percent higher will do.

In October 2007, Florida Power and Light (FPL), "a leader in nuclear power generation," presented its detailed cost estimate for new nukes to the Florida Public Service Commission. It concluded that two units totaling 2,200 megawatts would cost from \$5,500 to \$8,100 per kilowatt -- \$12 billion to \$18 billion total!

Lew Hay, chairman and CEO of FPL, said, "If our cost estimates are even close to being right, the cost of a two-unit plant will be on the order of magnitude of \$13 to \$14 billion. That's bigger than the total market capitalization of many companies in the U.S. utility industry and 50 percent or more of the market capitalization of all companies in our industry with the exception of Exelon." This, he said, "is a huge bet for any CEO to take to his or her board."

In January, MidAmerican Nuclear Energy Co. said prices were so high it was ending its pursuit of a nuclear power plant in Payette County, Idaho, after spending \$13 million researching its economic feasibility. Company president Bill Fehrman said, "Consumers expect reasonably priced energy, and the company's due diligence process has led to the conclusion that it does not make economic sense to pursue the project at this time."

MidAmerican is owned by famed investor Warren Buffett. When Buffett pulls the plug on a potential investment after spending \$13 million analyzing the deal, that should give everyone pause.

How expensive have nuclear plants become? So expensive that Duke Power has been refusing to reveal cost estimates for a nuclear plant for the Carolinas, saying it would reveal trade secrets. I kid you not. The Charlotte News & Observer reported in April, "'If Duke is requested to disclose the cost today, it will undermine the company's ability to get the lowest cost for its customers,' said Duke attorney Lawrence Somers. 'In light of the testimony today, the public advocacy groups want the cost of this plant to go up.'"

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Yes, those annoying public advocacy groups want to know the cost to the public of the plants before supporting them. The company actually testified that if everyone knew the plant's cost, that would "give tactical advantage to vendors and contractors during sensitive negotiations." What Duke seems to be saying is that if suppliers knew just how incredibly expensive the plant is, they would want a bigger piece of the pie. Such is the state of our free-market energy economy today.

Amazingly, North Carolina regulators agreed with Duke that the estimated cost is a "trade secret" under state law. South Carolina's consumer advocate, C. Dukes Scott, took a stance that was once called common sense in this country: "If you want the ratepayers to pay for something, are you going to tell them it's none of their business?"

In fact, back in February, Duke Energy CEO Jim Rogers told state regulators the plant would cost \$6 billion to \$8 billion, but a mere two months later said that estimate was "dated and inaccurate." Scott wondered, "If the cost wasn't confidential in February, how is it confidential in April?"

Let's take a look at one more example. Earlier this year, Progress Energy informed state regulators that the twin 1,100-megawatt plants it intends to build in Florida would cost \$14 billion, which "triples estimates the utility offered little more than a year ago." That would be more than \$6,400 a kilowatt. But wait, that's not all. As reported by the St. Petersburg Times, "The utility said its 200 mile, 10-county transmission project will cost \$3-billion more." If we factor that cost in, the price would be \$7,700 a kilowatt.

Amazingly, the utility won't even stand behind the exorbitant tripled cost for the plant. In its filing with state regulators, Progress Energy warned that its new \$17 billion estimate for its planned nuclear facility is "nonbinding" and "subject to change over time."

And it gets even better (by I which I mean, worse) for Florida ratepayers. Florida passed a law that allows utilities to recoup some costs while a nuclear plant is under construction. How much? About \$9 a month starting as early as next year! Yes, the lucky customers of Progress Energy get to each pay more than \$100 a year for years and years and years before they even get one kilowatt-hour from these plants.

This would seem to be the exact opposite of the old claim for the nuclear industry, "Too cheap to meter." Now it's so expensive the company raises your rates before the power even gets to the meter!

How the renewable industry would love to charge people before they built their plants. Even without that benefit, Jigar Shah, chief strategy officer of SunEdison, explained to me that he could guarantee delivery to Florida of more kilowatt-hours of power with solar photovoltaics -- including energy storage so the power was not intermittent -- for less money than the nuke plants cost.

Many other forms of carbon-free power are already cheaper than nuclear today, including wind power, concentrated solar thermal power and, of course, the cheapest of all, energy

efficiency. Over the past three decades, California efficiency programs have cut total electricity demand by about 40,000 gigawatt hours for an average 2 to 3 cents per kilowatt-hour. A May presentation of modeling results by the California Public Utilities Commission shows that it could more than double those savings by 2020.

If California's effort were reproduced nationwide, efficiency would deliver 130 gigawatts by 2020, which is more than enough energy savings to avoid the need to build any new power plants through 2020 (and beyond). And that means any new renewable plants built could displace existing fossil fuel plants and begin to reduce U.S. carbon dioxide emissions from the utility sector.

A May report by the Bush Energy Department concluded that Americans could get 300 gigawatts of wind by 2030 at a cost of 6 to 8.5 cents per kilowatt-hour, including the cost of transmission to access existing power lines. And the cost of integrating the variable wind power into the U.S. grid would be under 0.5 cents per kilowatt-hour. (Wind turbines provide energy on average 35 percent of the time. Nukes average 90 percent availability. That means it takes 300 gigawatts of wind capacity to deliver as much electricity as about 120 gigawatts of nuclear.)

Finally we have the reemergence of concentrated solar thermal power (also known as concentrated solar power, or CSP). Utilities in the Southwest are already contracting for power at 14 to 15 cents per kilowatt-hour. The modeling for the California Public Utilities Commission puts solar thermal at around 13 cents per kilowatt-hour. Because CSP has large cost-reduction opportunities from economies of scale and the manufacturing learning curve, the modeling foresees the possibility that CSP costs could drop an additional 20 percent by 2020. And those prices include six hours of storage capacity, which allows CSP to follow the electric load, and that is even better than nuclear power, which is constant around the clock.

All of these sources of electricity are considerably cheaper than the electricity that would be generated by new nuclear plants, which the commission estimates costs more than 15 cents per kilowatt-hour before transmission and delivery costs. This entire discussion doesn't even consider the issue of uranium supply, whose price has risen sharply in recent years. A big shift toward nuclear power would no doubt further increase prices. If, as many advocates want, we ultimately go toward reprocessing of spent fuel, that would add an additional 1.5 to 3 cents per kilowatt-hour to the cost of nuclear power.

Sen. McCain keeps saying, "If France can produce 80 percent of its electricity with nuclear power, why can't we?" Wrong question, Senator. The right question is: Why would we? Energy efficiency and renewables are the key to affordable, carbon-free electricity. They should be a focus of national energy and climate policy. Not nukes.

Visit [Climate Progress](#) to read "The Self-Limiting Future of Nuclear Power," Joseph Romm's extended analysis of nuclear energy. The report will available June 2 at 10 a.m. ET.