Nuclear Energy: Risky Business

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Nuclear energy is to the Right what solar energy is to the Left: Religious devotion in practice, a wonderful technology in theory, but an economic white elephant in fact (some crossovers on both sides notwithstanding). When the day comes that the electricity from solar or nuclear power plants is worth more than the costs associated with generating it, I will be as happy as the next Greenpeace member (in the case of the former) or MIT graduate (in the case of the latter) to support either technology. But that day is not on the horizon and government policies can't accelerate the economic clock.

Many free market advocates support nuclear because it costs less to generate nuclear power than it does to generate electricity from any other source (save, perhaps, hydroelectric power), thanks to nuclear's low operation and maintenance costs. However, someone has to first pay for-and build-these plants and the rub is that nuclear has very high, upfront construction costs ranging from $6-9 billion. By contrast, gas plants cost only a few hundred million dollars to build and coal a couple of billion depending upon the capacity and type of plant.

This raises the opportunity and risk costs of nuclear, making it unattractive to investors. Capital-intensive power facilities take longer to build, which means that investors have to defer returns for longer than if they had invested elsewhere. What's more, electricity markets have a very peculiar pricing mechanism that makes it harder for nuclear to maximize returns compared to gas-powered or other plants. In essence, there are two electricity markets: a market for base-load power (electricity sold 24-hours a day) and a market for peak power (electricity sold as needed during peak demand periods like hot summer days). Much of the demand for new power-and thus much of the profit available to investors today-is found in the peak market. But nuclear power plant construction costs are so high that it would take a very, very long time for nuclear facilities to pay for themselves if they only operated during high demand periods. Hence, nuclear power plants are only profitable in base-load markets. Gas-fired power plants, on the other hand, can be profitable in either market because not only are their upfront costs low but it is much easier to turn them off or on unlike nuclear.

Nuclear's high up-front costs don't just mean delayed profits, it also makes nuclear a more risky investment, especially since 20 states have scrapped policies that used to allow investors to charge rates that would guarantee their money back. This means that investors in new nuclear power plants are making a multi-billion dollar bet on disciplined construction schedules, accurate cost estimates, and the future economic health of the region. Bet wrong on any of the above and the company may well go bankrupt. Bet wrong on a gas-fired power plant, on the other hand, and corporate life will go on because there is less to lose given that the construction costs associated with gas-fired power plants are a small fraction of those associated with nuclear plants.
One metric that reflects this difference is the "levelized" cost—the price that must be received by owners to cover fixed and variable costs while returning profits to investors. This cost is substantially higher for nuclear than coal-fired electricity. Tufts economist Gilbert Metcalf, for instance, has calculated that, under current law, the levelized cost of nuclear power in the United States is 4.31¢ per kilowatt hour (kWh). Coal-fired electricity, on the other hand, cost 3.53¢ per kWh and "clean" coal cost 3.55¢.

But even these nuclear estimates are almost certainly too low. That's because Metcalf uses an "overnight cost" (construction costs minus financing costs) figure of $2,014 per installed kilowatt (kW) which is much too low. The Energy Information Administration (EIA) puts this cost at $2,475 per kW at present—although even this figure is suspicious because it relies on a world-wide average for nuclear power plant construction—including the grossly unreliable estimates from state-managed economies. The Standard & Poor's overnight cost estimate of $4,000 is likely the most reliable because it is based on nuclear plant construction costs in economies where labor and material costs are very similar to those found in the United States. Industry analyst Jim Harding, who uses overnight cost figures similar to Standard & Poor's, puts the levelized costs for new nuclear power generation at 12-15¢ per kWh right now.

Investors are also wary of nuclear plants because of the construction delays and cost over-runs that have historically plagued the industry. For instance, the Areva/Siemens nuclear power plant being built for TVO in Finland—the first nuclear power plant to be built in a relatively free energy market in decades—once scheduled to be operational within 54 months, is now two years behind schedule and 60% over budget. Nor have these construction delays had anything to do with regulatory obstruction or organized public opposition.

If nuclear power plants are so uneconomical, how then to explain the blizzard of permit applications for the construction and operation of new nuclear power plants that the Nuclear Regulatory Commission has received? Easy: These applications cost little and oblige utilities to do nothing. Industry analysts maintain that federal approvals will not translate into actual plants without a federal promise to private equity markets that, in case of default by power plants, the taxpayer will make good on the full sum of all bad nuclear loans.

Nuclear supporters often counter that construction costs would be a lot lower if regulators didn't impose insanely demanding safety standards, byzantine and time-consuming permitting processes, or endless public hearings, any one of which could result in the plant being stopped in its tracks. Investors would also be more likely to invest, we're told, if there were a high-level waste repository in place or more political support for nuclear power.

I would love to tell that story. I do, after all, work at the Cato Institute, and blaming government for economic problems is what keeps me in business. But what stops me is the fact that those complaints are not echoed by the nuclear power industry itself.

On the contrary, the industry in the early 1990s asked for—and got—exactly the sort of safety regulations, permit review process, and public comment regime now in place. Both public and political support for nuclear power is running so high that even a majority of Democrats in Congress are happy to not just tolerate nuclear power, but lavish even more subsidies upon it. And while Yucca Mountain may not be open now or ever, everyone seems reasonably content with the current on-site waste storage regime.

Indeed, if government were the reason why investors were saying "no" to their loan applications, I would
expect that industry officials would be the first to say so. But they do not.

There's another good reason why the industry is not protesting government intervention these days—the industry would not exist without it. Take away the 1.8¢ per kWh production tax credit available to the first 6,000 megawatts of new nuclear generation built prior to 2021, for instance, and Metcalf calculates that the levelized cost of new nuclear power plants jumps by 30 percent. Replace accelerated depreciation tax rules with regular depreciation rules and costs jump another 9 percent. Even zero taxation on nuclear power would increase costs by 6 percent because right now nuclear power enjoys a negative effective tax rate. Indeed, this jump by itself would make nuclear much more expensive than conventional coal, "clean" coal, and natural gas. Finally, repealing the $18 billion in federal loan guarantees recently promised the industry and eliminating regulations that relieve nuclear plant owners of the responsibility to pay third-parties to accept the risks associated with waste disposal would dampen market interest in nuclear power even further.

But the final nail in the coffin for the industry would be if the federal cap on the liability that nuclear power plant owners face in case of accidents (the Price-Anderson Act) were to be lifted.

Given all of this, how do France, India, China, and Russia build cost-effective nuclear power plants? They don't. Government officials in those countries, not private investors, decide what is built. Either these governments build expensive plants and shove them down the market's throat—or they build shoddy plants and hope for the best.

Conservatives project nuclear power as the solution to greenhouse gas emissions. But they should resist that argument. If we slapped a carbon tax on the economy to "internalize" the costs associated with greenhouse gas emissions—the ideal way to address emissions if we find such policies necessary—then the "right" carbon tax would likely be about $2 per ton of emissions according to a survey of the academic literature by climate economist Richard Tol. That's not enough to make nuclear energy competitive against coal or natural gas according to calculations performed by the Electric Power Research Institute. In any case, if nuclear offers a cost-effective way to reduce greenhouse gas emissions, it should have to prove it by competing against alternatives in some future carbon-constrained market.

There's nothing new about today's rhetoric about the supposed "nuclear renaissance." Back in 1954, GE maintained: "In five years—certainly within 10—a number of them (nuclear plants) will be operating at about the same cost as those using coal. They will be privately financed, built without government subsidy." Now, 54 years later, the talk of "renaissance" is back—as are promises about the imminent economic competitiveness of nuclear.

Those who favor nuclear power should adopt a policy of tough love. Getting this industry off the government dole would finally force it to innovate or die—at least in the United States. Welfare, after all, breeds sloth in both individual and corporate recipients. The Left's distrust of nuclear power is not a sufficient rationale for the Right's embrace of the same.