

## More (Climate-friendly) Nuclear Power? The Economic Challenge

By Joel Darmstadter\*

Along with increased reliance on wind and solar, a shift toward more nuclear power has frequently been cited as a way of lessening the carbon “footprint” associated with society’s dependence on fossil fuels. Alas, the likelihood of such a scenario appears to be dimming.

For more than two decades, the nuclear share of total U.S. electricity generation has stood at around 19 percent. If nuclear could successfully compete with coal or natural gas, market realities alone could promote a shift. Unsurprisingly, things aren’t that straightforward. A set of recent studies makes it possible to illustrate three key issues that need to be confronted. We must first face up to the social cost of carbon (SCC) resulting from fossil-fuel emissions. Second, we need to determine the impact of that cost on the overall cost of fossil-based electricity generation in new power plants. Third, we require a sense of how that added cost burden alters the competitive relationship between fossil and nuclear energy. It is that crucial third step, which, as we’ll see, makes the prospect of a robust U.S. nuclear revival problematic.

To keep things simple, let’s adopt an SCC centered on around \$50 per ton (in 2012 dollars) by the year 2020, based on the most recent federal interagency estimates. The second step is to rely on another recent study—in this case, by the Congressional Budget Office (CBO)—which calculated the approximate economic impact of the social cost of carbon on the U.S. economy. The CBO analysis allows one to approximate the increment to electricity generation costs that a \$50 carbon tax would result in. I judge that additional cost to be around three cents per kilowatt hour of fossil-based power.

To round out this series of calculations, it’s necessary to get a sense of electricity costs in newly commissioned power plants absent greenhouse-gas constraints. EIA estimates (in a stylized picture—once again, for around the year 2020) point to an average per-kWh generating cost for fossil fuels combined (in effect, a weighted average of coal and natural gas) of between 9-10 cents/kwh. Applying to that number the assumed carbon-charge increment of three cents yields a rounded figure of 12-13 cents. As it happens, EIA estimates generation costs for a new, advanced nuclear plant to also come to around 12 cents/kwh.

So where does that fossil-nuclear comparison take us? If nuclear power requires a carbon tax even greater than \$50/ton to have cost advantages over fossil energy, its renaissance may have to await advances in its own technology (e.g., the feasibility of small modular reactors that don’t sacrifice the scale economies associated with 1,000 megawatt nuclear plants). And a \$50/ton carbon price isn’t on the table. It is hard to defend a reluctance to risk large investments in nuclear electricity in a climate of blurred policy signals and mixed public support.

Underscoring that state of affairs, a just-released report by the Center for Strategic and International Studies (CSIS) acknowledges the prospect of “a substantial contraction of [U.S.] commercial nuclear energy in the coming years,” citing both the transformational impact of attractive natural gas prices and hesitancy in dealing with greenhouse gas mitigation. (Even as one of the few U.S. nuclear expansion prospects—Southern Company’s Vogtle complex in Georgia—proceeds apace, Duke Energy has just announced a halt to a planned facility in Florida. And generous state financial provisions may have helped spur the decision in the Georgia case.)

Pending renewed growth of U.S. nuclear power in the long term, the CSIS report urges an interim focus on the U.S. as a supplier of nuclear technology, fuel, and services in international markets. With nuclear power stalled domestically, that course could at least ensure some of nuclear’s benefits materializing in those places around the world where the outlook for nuclear market penetration may be less clouded.

But even in that respect, there’s the inevitable “on the other hand.” Japan’s nuclear future remains unclear in the wake of Fukushima. And with other major industrial nations, like Germany and France, pondering nuclear retrenchment—a phase-out in the former country and, as voiced by President Hollande, a one-third reduction in France’s nuclear electricity share by 2025—the bottom line for nuclear must be, at best, ambivalent: recourse to nuclear power as a significant antidote to greenhouse gas emissions seems—at least in the U.S.—unlikely in the short term and uncertain in the long term.

If what I’ve considered here points to an approximate standoff between the monetary cost of fossil- and nuclear-based electric generation, it is nonetheless important to recognize the limited perspective this brings to bear on the much

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