DOI: 10.2968/065006006

Bulletin of the Atomic Scientists

The nuclear renaissance meets economic reality

As plans for new U.S. nuclear power plants encounter problems, their proponents seek to shift ever more economic risk to taxpayers who are already staggering under the weight of other federal bailouts.

BY PETER A. BRADFORD

YEAR SEVEN OF THE U.S. NUCLEAR RENAISSANCE SEEMS a lot like 1978. Of the 26 new reactor applications submitted to the Nuclear Regulatory Commission (NRC) since 2007, nine have been cancelled or suspended indefinitely in the last nine months. Ten more have been delayed by one to five years.

How could an industry that previously took the country through a blizzard of cancellations and cost overruns, which *Forbes* in 1985 called "the largest managerial disaster in business history," have reached the brink of another bust, this time without pouring an ounce of concrete? The answer does not lie in the current recession or in the recent bizarre demands from congressional Republicans that NRC Chair Gregory Jaczko "explain his resistance to nuclear power." Instead, for the industry's most ardent congressional champions, the answer is no further away than the nearest mirror.

The U.S. nuclear renaissance began in 2002, when the Bush administration announced its Nuclear Power 2010 program. Its goal was to deploy new reactors in the United States "in the 2010 time frame." With 2010 nearly upon us, this expectation can take its place beside "greeted as liberators" and "heck of a job, Brownie" in the annals of that administration's under-informed optimism.

Nuclear Power 2010 contemplated federal support for two reactor applications—one light water reactor and one gas-cooled reactor. These two projects were to establish the viability of the NRC's reformed licensing process, under which applicants for individual reactor licenses could cross-reference previously approved generic reactor designs without having to do more than accommodate them for a particular physical site. Based on these changes, the nuclear industry anticipated that a steady stream of combined license (COLs)

IT IS 5 MINUTES TO MIDNIGHT
www.thebulletin.org

applications for new nuclear reactors would fulfill its goal of 50,000 megawatts of new nuclear capacity by 2020, an aspiration that now seems high by a factor of 10.

In 2003, an MIT study compared the economics of new nuclear reactors to coal and gas (although it did not compare nuclear to the costs of energy efficiency or to renewable energy). It concluded that support would be justified for "a few first mover plants" to test whether nuclear power could be competitive and useful in fighting climate change. The study urged that support take the form of production tax credits to assure that taxpayer monies paid for kilowatt-hours generated rather than cancelled plants or cost overruns.

But the industry and its congressional champions were not satisfied with a moderate program. Instead, deeming new nuclear reactors successful in advance, they set up an impetuous mess of incentives and high-risk political gambits that have resulted in the current debacle. The foundation for the collapse was set by Congress in the 2005 Energy Policy Act. That measure contained several incentives structured to ensure that eligible applications be at the NRC by December 2008—the end of the Bush administration. Energy Department officials, having quietly redefined Nuclear Power 2010 to be a *decision* in 2010 to build a reactor by 2015, made it clear to U.S. nuclear power plant owners that they would not look favorably on a renaissance to which nobody came.

Congress's incentives paid no heed to whether there was a real need for the plants, whether the money was available to pay for them, whether the construction capabilities existed, or whether the referenced designs in fact would be licensed. For its part, the NRC promised to complete its reviews on schedule—provided that the applicant's submissions were complete, a condition the applicants have yet to fulfill.

The result was a strangely shaped revival in which some 17 new applications for 26 reactors clogged the NRC's mailbox in the 18 months prior to January 2009. Only five more applications are expected by the end of 2010. The 2008 congressional deadline, it seems, produced this rush-and-repose response, which goes against the pattern to be expected by an industry committed to learning from "a few first movers."

Furthermore, two of the announced standard designs—Areva's Evolutionary Power Reactor and GE-Hitachi's Economic Simplified Boiling Water Reactor—have not been approved by the NRC, and Toshiba-Westinghouse's AP-1000 design, the basis for several other projects, was revised in 2007 in ways that require further commission review.

Only NRG Energy's application to build two GE-Hitachi Advanced Boiling Water Reactors in Texas seemed to fulfill the vi-

sion of an NRC-approved design to be referenced in a COL application. It was an illusion, however. The application, which was widely hailed as the U.S. nuclear renaissance flagship, was incomplete—very incomplete.

The NRC could not docket NRG Energy's application until more information was received. Then the commission suspended the process altogether rather than schedule a public review of the project with significant data missing. By early 2008, NRG Energy had increased its cost estimate, changed vendors, and announced a two-year project delay. The NRG Energy cost estimate increased again this year to $10 billion, and San Antonio's CPS Energy, an essential joint owner, whose cost estimate is $13 billion, has yet to officially sign on to the project.

Since most of the plans for new nuclear build in the United States have been either cancelled or delayed, nuclear power enthusiasts now pin their hopes on federal loan guarantees. So only to the extent that taxpayers can be forced to shoulder massive economic risks will new reactors proceed.

Warnings came throughout 2008 that the politically driven application pace might not be in the industry's best interest. In January, then NRC Chair Dale Klein stated a preference for a scenario in which construction "started small," with one demonstration pressurized water reactor and one boiling water reactor, allowing the NRC to put its "A-Team" on each project. In April, the Nuclear Energy Institute's Senior Vice President (now its CEO) Marvin Fertel told an American Bar Association conference that he hoped the industry would advance a first group of new reactors consisting of no more than "four to eight units." He added that none were likely to come online before 2016.

Speaking at the same conference, David Matthews, the NRC's director of new reactor licensing, made clear that the new process was not going smoothly. According to *Nucleonics Week*, Matthews said, "The agency's expectations for new plant licensing applications have not matched the reality of the submittals." He cited the fact that the NRC originally had thought that COLs would reference reactor designs that had already been approved by the NRC. Instead, nearly all COL applications are moving through the approval process together with the designs that they reference. The commission also had hoped that reactor design certification applications would be complete when submitted. Instead, many design changes have been made once review has begun, causing delays. Finally, Matthews said that the NRC had initially expected only "minimal departures from the design control document" but that every application to date has included modifications to standard reactor designs or design certification amendments.

Since the incomplete filings were driven not by any real need

for the plants but by federal incentives, these inevitable licensing delays have done no real harm. The delays were, however, inconsistent with political imperatives. Republican energy policy in the 2008 presidential campaign called for 45 new nuclear reactors by 2030. After the election, the GOP doubled down to 100 new plants by 2030.

But the harder Congress pushed, the worse things got. When Entergy announced that it would not build reactors at two planned sites, company CEO Wayne Leonard said of the company's inability to achieve a satisfactory risk-sharing agreement with the reactor designer, GE-Hitachi, "We spent an enormous amount of time trying to get to where we are, which is, frankly, nowhere."

Difficulties surrounding the Tennessee Valley Authority's Bellefonte application caused the lead COL designation for the AP-1000 to shift to Southern Company's Vogtle plant in Georgia. The NRC staff first warned Toshiba-Westinghouse that the commission could not commit to an AP-1000 license-review schedule in light of belated and inadequate responses it was receiving from the company. Then in October, the NRC rejected aspects of the proposed license revision altogether, throwing major new uncertainty into all of the AP-1000 COL schedules. Meanwhile, cost estimates for new reactors have risen as natural gas prices have declined precipitously. The recession and expanding state and federal energy-efficiency programs have postponed estimated demand for additional electricity—often exaggerated in any case—by at least five years.

In the face of these cancellations and delays, nuclear power enthusiasts now pin their hopes on a new load of federal loan guarantees. So only to the extent that taxpayers can be forced to shoulder massive economic risks will new reactors proceed. But these are the very economic risks that Entergy (and Exelon and Dominion) have tried unsuccessfully to require companies such as GE-Hitachi to share in greater part. Widespread loan guarantees will reward the vendors who refuse to carry their share of the risks. Furthermore, taxpayers are, of course, in no position to manage them (since they are only being asked to guarantee loans, not participate in the projects or decision making). The incentives to control costs will be reduced accordingly.

Another favorite gambit is back in vogue as well: lamenting U.S. "loss of leadership" to braver and wiser foreign rivals. In 1985 this charge was aimed at the Soviet Union, a year away from Chernobyl and five years away from collapse. Today, China is the nuclear bogeyman, although the head of China's National Energy Agency recently warned that nuclear development was proceeding too fast in some regions: "We'd rather move slower and achieve less than

incur potential safety concerns in terms of nuclear energy."

Nuclear advocates repeat their unfortunate history when they blame the NRC and skeptics for delays, pour in more subsidies, enact statutory licensing deadlines and quotas, stir up local officials and editorial boards to pressure Washington to deliver often illusory economic benefits, and run expensive advertising campaigns to tell the public how much the public now likes nuclear power. These were staples of the "managerial disaster" that *Forbes* described back in the mid-1980s.

The United States can revert to the sensible notion of limited support for a few first-mover nuclear projects or it can insist that U.S. taxpayers continue to underwrite a "revival" that the industry has proven unable to manage. This is the choice that will play out in the context of pending climate legislation in Congress during the next few months. ■

Peter A. Bradford was a member of the Nuclear Regulatory Commission from 1977 to 1982. He is former chair of the New York and Maine utility regulatory commissions and a member of the China Sustainable Energy Policy Council. He has served on a number of panels relating to nuclear energy, including the Keystone Center's 2007 fact-finding steering committee, a panel to evaluate the reliability of the Vermont Yankee Nuclear Power Plant, and another on how best to replace the remaining Chernobyl nuclear plants in Ukraine. He also is an adjunct professor at Vermont Law School, where he teaches on nuclear power and public policy.

Peter A. Bradford, "The nuclear renaissance meets economic reality," *Bulletin of the Atomic Scientists*, November/December 2009, vol. 65, no. 6, pp. 60–64.

DOI: 10.2968/065006006