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Nuclear Energy Loses Cost Advantage

By DIANA S. POWERS

PARIS — Solar photovoltaic systems have long been painted as a clean way to generate electricity, but expensive compared with other alternatives to oil, like nuclear power. No longer. In a “historic crossover,” the costs of solar photovoltaic systems have declined to the point where they are lower than the rising projected costs of new nuclear plants, according to a paper published this month.

“Solar photovoltaics have joined the ranks of lower-cost alternatives to new nuclear plants,” John O. Blackburn, a professor of economics at Duke University, in North Carolina, and Sam Cunningham, a graduate student, wrote in the paper, “Solar and Nuclear Costs — The Historic Crossover.”

This crossover occurred at 16 cents per kilowatt hour, they said.

While solar power costs have been declining, the costs of nuclear power have been rising inexorably over the past eight years, said Mark Cooper, senior fellow for economic analysis at Vermont Law School’s Institute for Energy and Environment.

Estimates of construction costs — about $3 billion per reactor in 2002 — have been regularly revised upward to an average of about $10 billion per reactor, and the estimates are likely to keep rising, said Mr. Cooper, an analyst specializing in tracking nuclear power costs.

Identifying the real costs of competing energy technologies is complicated by the wide range of subsidies and tax breaks involved. As a result, U.S. taxpayers and utility users could end up spending hundreds of billions, even trillions of dollars more than necessary to achieve an ample low-carbon energy

supply, if legislative proposals before the U.S. Congress lead to adoption of an ambitious nuclear development program, Mr. Cooper said in a report last November.

The report, “All Risk, No Reward for Taxpayers and Ratepayers,” was a response to a legislative wish list developed by the Nuclear Energy Institute, an industry group. The institute has called for a mix of U.S. subsidies, tax credits, loan guarantees, procedural simplifications and institutional support on a large scale.

At the state level, the industry has also pressed the case for “construction work in progress,” a financing system that requires electricity users to pay for the cost of new reactors during their construction and sometimes before construction starts. With long construction periods and frequent delays, this can mean that electricity users start to pay higher prices as much as 12 years before the plants produce electricity.

The institute’s Web site says the financing system “reduces the cost ratepayers will pay for power from the plant when it goes into commercial operation,” by lowering interest payments on capital costs and spreading the costs over time.

“The utilities insist that the construction work in progress charged to ratepayers also include the return on equity that the utilities normally earn by taking the risk of building the plant — even though they have shifted the risk to the ratepayers,” Mr. Cooper said. “If the plant is not built or suffers cost overruns, the ratepayers will bear the burden.”

History suggests that the risk of this is not negligible. In 1985, Forbes magazine dubbed the construction of the first generation of U.S. nuclear plants “the largest managerial disaster in business history.”

The first round of plants resulted in write-offs through bankruptcies and “stranded costs” — investments in existing power plants made uncompetitive by deregulation — which essentially transferred nearly $100 billion in liabilities to electricity users, said Doug Koplow, an economist and founder of Earth Track, based in Cambridge, Massachusetts, which campaigns against subsidies it considers environmentally harmful. “Although the industry frequently points to its low operating costs as evidence of its market

competitiveness, this economic structure is an artifact of large subsidies to capital, historical write-offs of capital, and ongoing subsidies to operating costs," Mr. Koplow said.

From 1943 to 1999 the U.S. government paid nearly $151 billion, in 1999 dollars, in subsidies for wind, solar and nuclear power, Marshall Goldberg of the Renewable Energy Policy Project, a research organization in Washington, wrote in a July 2000 report. Of this total, 96.3 percent went to nuclear power, the report said.

Still, these costs pale in comparison with the financial risks and subsidies that are likely to accompany the next wave of nuclear plant construction, Mr. Cooper said.

A November 2009 research report by Citigroup Global Markets termed the construction risks, power price risks, and operational risks "so large and variable that individually they could each bring even the largest utility to its knees."

Those risks were mentioned in a 2009 report by the credit rating agency Moody's. "Moody's is considering taking a more negative view for those issuers seeking to build new nuclear power plants," the report said. "Historically, most nuclear-building utilities suffered ratings downgrades — and sometimes several — while building these facilities. Political and policy conditions are spurring applications for new nuclear power generation for the first time in years. Nevertheless, most utilities now seeking to build nuclear generation do not appear to be adjusting their financial policies, a credit negative."

Adding to the risks facing any reactor construction program, only one of five proposed designs under consideration by U.S. utilities has ever been built, the Nuclear Regulatory Commission said.

"No one has ever built a contemporary reactor to contemporary standards, so no one has the experience to state with confidence what it will cost," said Stephen Maloney, a utilities management consultant. "We see cost escalations as companies come up the learning curve."

Market risk has been heightened by the recent recession. "The current crisis

has decreased energy demand even more than the 1970s oil price shocks," Mr. Cooper said. The recession "appears to have caused a fundamental shift in consumption patterns that will lower the long-term growth rate of electricity demand."

Meanwhile, most of the projects that have created the increase of license applications to the regulatory commission have already experienced difficulties. "About half of the projects that have been put forward at the start of the next generation of reactors have been delayed or canceled," Mr. Cooper said. "Those that have moved forward have suffered substantial cost escalation and several have received negative financial reviews.

"Of the 19 applications at the N.R.C., 90 percent have had some type of delay or cancellation, run into a design problem, suffered cost increases and/or had the utility bond rating downgraded by Wall Street."

Despite the economic challenges, the nuclear power industry remains unfazed.

"This is not a hospitable environment in which to commission any large base-load power plant," said Marvin Fertel, president and chief executive of the Nuclear Energy Institute, in a briefing to the financial community. Still, he said: "Fortunately new nuclear plants won't be in service until 2016 or later, so today's market conditions are not entirely relevant."

Mr. Cooper said the industry's equanimity was based, at least partially, on the supportive cushion provided by loan guarantees and work-in-progress financing. "With such financing the utility is making a one-way bet, allowing it to make a profit even when the project fails," he said. "The people bear the risks and costs; the nuclear utilities take the profits. Without loan guarantees and guaranteed construction work in progress, these reactors will simply not be built, because the capital markets will not finance them."

Without public guarantees, nuclear projects often cannot get financing. AmerenUE, the Missouri utility, suspended in April 2009 plans to build a $6 billion, 1,600-megawatt reactor at its Callaway County nuclear site, after trying unsuccessfully to get the State Legislature to repeal a longstanding ban on work-in-progress financing. The continued existence of the ban "makes financing a new plant in the current economic environment impossible," the

utility said.

Similarly, Florida Power and Light said in January that it would not proceed beyond licensing with plans to build two new reactors at its Turkey Point site, after the Florida Public Service Commission rejected its request to pass on a $1.27 billion cost increase to its users.

Yet, despite episodic resistance at the local level, financial support for the industry at the U.S. government level has been increasingly evident in successive versions of climate and energy bills before the U.S. Congress, including the most recent, the American Power Act, which is delayed in the Senate until after the summer recess.

Nuclear subsidies in the Senate proposal include five-year accelerated depreciation; tax credits for investments and production and eligibility for the advanced energy tax credit; an increase in government insurance against regulatory delays; access to private activity bonds; and a $36 billion increase in loan guarantees, bringing the total to $56 billion.

That remains less than the Nuclear Energy Institute's goal of $100 billion, an amount it describes as "a minimal acceptable loan volume." Still, Mr. Fertel said in his financial briefing that "'strong political support' understates our position."

Federal loan guarantees cut nuclear construction financing costs by allowing the utilities to sell bonds at a lower interest rate. But at the same time the guarantee means that "the U.S. Treasury, and therefore the taxpayers, are on the hook for the value of the loans should they go bad," Mr. Cooper said.

According to the U.S. Government Accountability Office, the average risk of default for such Department of Energy loan guarantees is about 50 percent, which is the historic rate for the nuclear industry.

Mr. Koplow of Earth Track said two of the other subsidies in the Senate bill, the investment tax credit and five-year accelerated depreciation, would together "be worth between $1.3 billion and nearly $3 billion on a net present value basis per new reactor.

"This is equivalent to between 15 and 20 percent of the total all-in cost of the

reactors, as projected by industry."

Over all, Mr. Koplow said, the proposed subsidy package would undermine the equity requirements of the nuclear loan guarantee program, designed to ensure that investors have a strong interest in the long-term success of the venture. "Although investors will get all the profit if the reactor project is successful, they will bear virtually none of the financial risk if the project fails," he said. "This is a disastrous incentive structure."

By distorting energy markets, these subsidies would "effectively make the government the chooser of which energy technologies will be winners and which will lose," he said. The American Power Act "does not build a neutral policy platform on which all energy technologies must compete."

The tax breaks for nuclear would "greatly impede market access for competing energy sources," Mr. Koplow said.

He said handing out huge subsidies would also cloud the transparency of decision-making. "This approach," he said, "which replaces price signals with decisions by a handful of often unnamed individuals within the U.S. Department of Energy, plays to none of the inherent strengths of the U.S. market system to spur innovation and effectively allocate risks and rewards. Further, the basis, and sometimes scale, of these subsidy decisions is largely hidden from the public view."

For Mr. Cooper, the core issue at stake is one of opportunity cost. "While the cost estimates of nuclear power continue to rise, the potential for energy efficiency measures to reduce the need for energy are far cheaper," he said.

Lower-cost, low-carbon technologies are already available, and cost trends for several others indicate that a combination of efficiency and renewable technologies could meet projected power needs while also achieving aggressive carbon-reduction targets, Mr. Cooper said.

In a June 2009 report drawing on several earlier studies, Mr. Cooper said that energy efficiency, cogeneration and renewable sources could meet power needs at an average cost of 6 cents per kilowatt hour, compared with a cost of 12 cents to 20 cents per kilowatt hour for nuclear power.

Choosing the nuclear route, and constructing 100 new reactors, would translate into an extra cost to taxpayers and electricity users of $1.9 trillion to $4.4 trillion over the 40-year life of the reactors, compared with the costs of developing energy efficiency and renewable sources, the report said.

Mr. Cooper said it would make sense for policy makers, standing in the place of the market, to choose the least costly alternatives first.

“In an attempt to circumvent the sound judgment of the capital markets, nuclear advocates erroneously claim that subsidies lower the financing costs for nuclear reactors and so are good for consumers,” he said. “But shifting risk does not eliminate it. Furthermore, subsidies induce utilities and regulators to take greater risks that will cost the taxpayers and the ratepayers dearly.

“The risks that have dismayed Wall Street should be taken seriously by policy makers because they would cost not just hundreds of billions of dollars in losses on reactors that are canceled, but also trillions in excess costs for ratepayers when reactors are brought to completion by utilities that fail to pursue the lower-cost, less risky options that are available.

“The frantic effort of the nuclear industry to increase federal loan guarantees and secure ratepayer funding of construction work in progress from state legislatures is an admission that the technology is so totally uneconomic that the industry will forever be a ward of state, resulting in a uniquely American form of nuclear socialism.”

This article has been revised to reflect the following correction:

Correction: July 27, 2010

An earlier version of this article incorrectly identified Vermont Law School as an affiliate of the University of Vermont.