

**Energy Hearing on Nuclear Energy Development**  
**March 18, 2009**

**QUESTIONS FOR THE RECORD**

**From Senator Maria Cantwell**

**QUESTION #2:**

**Mr. Fertel and Mr. Cochran:** (a) What are utilities estimating the per kilowatt cost of constructing a new nuclear power plant?

(b) How long will it take to build a plant once its license is approved?

(c) I understand that AREVA's experience building one of their new standardized plants in Finland has not been ideal. What can we learn from that project that can inform the current debate on whether to construct new nuclear plants today?

(d) Given the other clean energy alternatives out there and the need to quickly build more capacity to meet growing electricity demand, what is the business case for a utility to build a new nuclear plant? How do the costs of new reactors compare with projected costs for wind or solar facilities in the decade it will likely take to get a new nuke plant up and running?

**Dr. Cochran's Response:** (a) The best recent public estimates of the cost of construction of new nuclear plants in the United States are those that have been presented to public utility commissions associated with: the proposal by Progress Energy to build two AP1000 plants (Units 1 & 2) at a new site in Levy County, Florida; the proposal by Georgia Power, a unit of Southern Company, to build two AP1000 plants (Units 3 & 4) at the existing Alvin W. Vogtle Nuclear Power Station in Georgia; and the proposal by South Carolina Light and Gas to build two AP1000 plants (Units 2 & 3) at the existing Virgil C. Summer Nuclear Power Station. The estimated plant "overnight costs," i.e., construction cost before borrowing charges, allowances for inflation and real cost growth during construction, and other owner's costs, are in the range of \$3,000 to \$6,000 per kilowatt, where the upper end of this range includes the cost of new transmission lines and facilities. New nuclear plant cost estimates are a moving target given that the best estimates of the costs of new nuclear plants have doubled over the past five or six years.

(b) If a license for a new plant is approved, it would likely take from four to six years to construct the reactor and perhaps another year before it is fully operational. The nuclear industry is in a better position than NRDC to estimate the actual time of construction.

(c) Construction of AREVA's new Evolutionary Pressurized Water Reactor (EPR) at the Olkiluoto nuclear site in Finland began in August 12, 2005, but has already fallen three years behind schedule to 2012, after safety and quality-assurance problems with the piping, containment liner and concrete base slab were discovered. This has put the Finnish EPR 50 percent over budget with a current estimated cost of at least \$6.7 billion.

AREVA's partner Siemens has pulled out of the project, leaving AREVA to buy out Siemens' share at an estimated cost to AREVA of \$2.6 billion.

Construction of a second EPR, at Flamanville, France, began December 3, 2007, and the construction period was estimated to be 54 months but has encountered problems. Construction of this plant is being managed by Électricité de France (EdF). In the summer of 2008, Autorité de Sûreté Nucléaire (ASN), the French nuclear safety authority, shut down the construction site due to safety concerns about technical and quality-control problems with the reinforced steel used in the concrete base. ASN's action followed a series of letters from the agency to Flamanville's construction manager. In the letters, ASN inspectors highlighted a range of problems including nonconformities in the pinning of the steel framework of the concrete base slab, incorrectly positioned reinforcements and inadequacy of technical inspection by both the construction companies and EdF. Inspectors also uncovered inconsistencies between the blueprint for reinforcement work and the plan for its practical implementation. They noted incorrect composition of concrete that could lead to cracks and rapid deterioration in sea-air conditions. Concrete samples were also not collected properly, according to ASN. Cracks have already been observed at part of the base slab beneath the reactor building. The supplier of the steel containment liner reportedly lacks the necessary qualifications. Fabrication of the liner was continuing despite quality failures demonstrating the lack of competence of the supplier. As a result, one quarter of the welds of the steel liner in the reactor containment building were deficient. [WISE, "Flamanville EPR Construction Suspended," "Nuclear Monitor, June 5, 2008].

EdF insists the Flamanville EPR will open on schedule in 2012, despite news reports that put the project nine months behind schedule after just nine months of construction. In early March 2009, EdF ran afoul of the European Commission, which raided the company's offices, suspecting EdF of antitrust violations and illegal price hikes.

(d) Commercial nuclear power plants are not a "clean energy alternative." In light of the potential for improvements in energy efficiency and the recent downturn in the economy, we do not see a "need to quickly build more capacity to meet growing electricity demand."

In any event, the cost of new nuclear plants and other supply alternatives will vary from site to site and over time. Before committing to build a new nuclear power plant a utility or energy generating company should, among other considerations, be required by the public utility commission to demonstrate that the projected energy need cannot be met by an integrated portfolio of alternatives that has a lower average delivered cost to the customer. The mix of alternatives should include improvements in energy efficiency, matched with renewables firmed by natural gas and distributed sources of industrial waste-heat cogeneration. Estimates of the cost of fossil-fueled alternatives should be based upon meeting effective constraints on carbon emissions, and nuclear electricity costs should be assessed without assuming that they will be paid down by federal, state and local government subsidies and federal loan guarantees, and should include charges that cover the full cost of storing and disposing of spent nuclear fuel.

To us the most important public policy issue with respect to nuclear financing is not what the plants will ultimately cost—the honest answer today is nobody really knows—but who should bear the financial risk of such large and costly nuclear projects. The best science and engineering available suggests that we are not close to the point of exhausting the cost-effective decarbonization potential available from a wide range of renewable energy and efficiency technologies that are cleaner, intrinsically less hazardous than nuclear power and can be deployed more quickly. Basic considerations of economic logic and sound public investment suggest that we turn our attention first to exploiting the full potential of these more benign energy sources where it is economical to do so, and turn to nuclear at the point when the marginal cost of adding another megawatt of efficiency savings, wind, biogas, or solar exceeds the true life cycle cost to society of adding a megawatt of nuclear power.

The public policy justification for taxpayers to bear the downside economic risks of private investments in costly new nuclear plants that, from a technical standpoint, do not differ significantly from existing nuclear power technology, and show no likelihood of delivering lower costs to electricity consumers and ratepayers, is highly dubious in our view. On the one hand, there are a host of rapidly evolving clean energy and efficiency technologies that have low current market penetration and enormous decarbonizing potential. On the other hand, we have a mature nuclear power industry with a 20 percent market share demanding public support for massive reactor investments that in many regulated electricity markets will likely displace, not dirty cheap existing coal-fired generation, but relatively cleaner new natural gas capacity and potentially cheaper distributed generation from biomass, biogas, waste-heat cogeneration, wind, and PV solar.

If the utilities and merchant companies seeking to deploy new nuclear units are truly convinced of their economic viability, and are merely concerned that the first-of-a-kind project execution risk for their own particular project could undermine their individual balance sheets, then the appropriate solution is more widespread private cross-ownership of the initial tranche of reactor projects, so that several companies share the risk of each individual project. The solution is not to load the downside economic risk of a historically noncompetitive industry onto taxpayers, while reserving the risk-reduced economic upside for highly leveraged limited liability corporations with only 20 percent equity invested from one or a few private owners.

Bottom line on cost: Let the \$18.5 billion in loan guarantee authority already provided by Congress do what it was originally designed to do: reduce the economic risk of deploying the first two or three “first-of-a-kind” units of innovative reactor designs new to the American market. If these initial projects vindicate the economic potential of new Gen 3+ nuclear power plants, then presumably there will be no need for further government support. If they do not provide such evidence of viability, then presumably both industry and government will look to other generating technologies in the near term, and focus on a program for developing a more cost-effective nuclear reactor candidate for deployment in 2025 and beyond. Either way, enlargement of the nuclear loan guarantee program is not needed now, and could even be harmful by handing a position in the market to

nuclear power technologies and projects that do not deserve to be there based on their intrinsic levels of performance. Either ratepayers or taxpayers will be forced to make up the difference.

**From Senator Maria Cantwell**

**QUESTION #3:**

As you know, Congress authorized DOE to guarantee loans that support early commercial use of advanced technologies if there was a reasonable prospect of repayment. And currently, \$18.5 billion of the allotted \$38.5 billion for the loan guarantee program is earmarked for nuclear power projects. But the GAO has since estimated that the average risk of default for DOE loan guarantees could be 50 percent or higher and Wall Street has put the industry on notice that it won't provide loans without a complete underwriting by the federal government.

**Mr. Fertel, Mr. Cochran:** Do you agree with GAO's assessment of the average risk of default for new nuclear plants? If you disagree please detail your objections to their analysis and provide your estimate of the average risk of default for the 17 pending nuclear plant applications. Given your estimate, please quantify the likely cost to the US Treasury of those defaults.

Do you support the Energy Department pursuing non-cash equity such as land or other assets as part of a loan guarantee package?

**Dr. Cochran's Response:** We do not have independent information to determine the validity of the GAO assessment of the probability of default for new nuclear plants. In the United States there were 110 operational nuclear power plants in 1990 and 104 operational plants today. According to our records, more than 130 proposed U.S. power reactors were cancelled before becoming operational. Of these cancelled reactors, many were cancelled before construction. We have identified one reactor that was cancelled after construction was completed. We have identified another 20 reactors that were cancelled during construction. And we have identified yet another 22 reactors that were cancelled after a construction permit was issued. While these data suggest that the future default rate could be high, we are not in a position to judge the relevance of this historical information for estimating future default rates. One reason to expect a lower default rate is precisely because of this financial train wreck that ended the first nuclear build-out. People have presumably learned from this experience and would not rush headlong into risking large sums without due diligence and more careful sharing of the risks between reactor vendors, constructors, and owners.

Equally important, the global economy is in recession because bank and other financial institutions bundled toxic assets with less risky assets in order to remove or lessen the risks associated with the higher risk loans. Surely we have learned that separating the risk of investments from the investments themselves carries a significant risk.

In short, for the reasons outlined in our testimony, we do not support Federal loan guarantees for the construction of new nuclear power plants in any form.

**From Senator Maria Cantwell**

**QUESTION #4:**

When the loan guarantee program was created in the 2005 Energy and Policy Act it was intended to promote a small number projects for new and innovative energy sources that did not have the proven track record necessary for Wall Street financing.

**Mr. Fertel, Mr. Cochran:** Please describe how the 17 projects that have applied to the DOE loan guarantee program to date employ “new and innovative” technology relative to the 104 nuclear power plants up and running today.

**Dr. Cochran’s Response:** Some of the proposed reactor designs are not new or innovative. The ABWR, for example, is an old design although none are operating in the United States today. General Electric submitted the Standard Design Certification Application for the ABWR to the U.S. Nuclear Regulatory Commission (NRC) in piecemeal format from September 29, 1987, through March 31, 1989. The NRC issued a final rule certifying the ABWR design on May 12, 1997. Two ABWR in Japan, Kashiwazaki Kariwa Units 6 and 7, began construction in September 1991 and February 1992, and became operational in 1996 and 1997, respectively. Both were then shut down as a consequence of the earthquake near the site on July 16, 2007. Three additional ABWRs are under construction, two in Taiwan and one in Japan.

AREVA claims the USEPR is safer than previous PWRs built in France, but AREVA also claims the EPR is “a mature design based on familiar technology.”

The French government owns 93 percent of the stock in AREVA, which is the vendor of the USEPR. The French government is also the principal investor in Électricité de France (EdF) which proposes through a joint venture (Unistar Nuclear) with Constellation Energy (partially owned by EdF) to build a USEPR at the Calvert Cliffs Nuclear Power Station in Maryland. If built EdF would own about one-half of the new unit. It makes no sense for U.S. taxpayers to subsidize the construction of a French plant whose majority owner will be EdF, the French government electricity monopoly, or guarantee the French government’s investment risks in these plants through U.S. taxpayer-backed loan guarantees. If the French government wishes to insure EdF against the risks of investing in the U.S. nuclear power market, in the same way that the Overseas Private Investment Corporation (OPIC) reduces risks for U.S. investors making overseas investments, the French government is welcome to do so, but there is no reason why U.S. taxpayers should assume the vast share of the economic risk of helping a foreign state-owned company to penetrate the U.S. nuclear electricity market, and drive up their electricity costs in the process. This outcome makes no economic or political sense.

**From Senator Lisa Murkowski  
Dr. Thomas Cochran, Senior Scientist, Natural Resources Defense Council**

1. In your written testimony you refer to the political sun setting on the Yucca Mountain project and argue that the Congress should initiate a search for a new geologic repository site for spent nuclear fuel.

Given that the Department of Energy conducted such a study in the early 1980s why is the NRDC confident that such a study would yield substantially different results today?

Why is it reasonable to assume that any site selected would avoid the same political fate as the Yucca Mountain repository?

**Response:** The site selection process for two geologic repositories as required by the Nuclear Waste Policy Act of 1982 (NWPA of 1982) was corrupted. First, the Department of Energy (DOE), in its initial selection of candidate media and sites for a repository, showed a preference for sites on DOE and other federal lands. Then, the U.S. Congress short-circuited the site selection process by choosing the single Yucca Mountain site for development as a repository.

Before initiating a new site selection process, Congress and the Administration should seek an independent study, followed by Congressional hearings, to fully understand what went wrong in the site selection process of the 1980s and then put in place safeguards to prevent repetition of previous mistakes. If something along these lines is not done, NRDC would not have confidence that a new search would yield results different from the failed efforts to site a repository at Lyons, Kansas or at the Yucca Mountain site in Nevada.