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The nuclear "renaissance" stalls with pending collapse of proposed Calvert Cliffs-3 reactor in Maryland

The flagship project to build a new nuclear power reactor in the United States—the one that provided the economic model for most new reactor proposals since—is in serious trouble and likely will collapse of its own weight before construction could even begin.

What this means for the much-hyped nuclear "renaissance" is clear: there will be no large-scale nuclear revival in the United States, and probably not in the rest of the world either, since the pressures on this project are international in scope, and affect just about every nation not named China.

UniStar Nuclear Energy, a joint venture of Electricite de France (EDF) and Maryland-based Constellation Energy, was formed to build the Calvert Cliffs-3 reactor on the shore of the Chesapeake Bay in Maryland, and had ambitions to build several other nuclear reactors in the U.S. as well. Agreements had been reached to build in at least New York, Missouri, and Pennsylvania, and projects in Idaho and Texas were being considered. All were to be based on the French government's Areva EPR design, two prototypes of which are being built in Finland and France.

But in late July, everything began publicly falling apart. Mayo Shattuck, CEO of Constellation Energy, told an investors' conference call July 28 that the company is slowing down its spending on the project. Between the lines, Shattuck admitted that Unistar is nearly out of money, having run through some $600 million since mid-2007 with little to show for it.

Shattuck pressed for a taxpayer bailout of his project. "We can't keep going at the rate we're going without clarity on the loan guarantee," Shattuck told the investors gathered on the call. Shattuck was referring to UniStar's application to the Department of Energy for billions in taxpayer loans to build the reactor.

Shattuck didn't explain why taxpayers should put up some $8-10 Billion for a company that is running out of money on a nuclear construction project before the first shovel has been put in the ground. Not to mention a company that has apparently spent nearly all of its assets over the past three years yet remains more than two years away, at a minimum, from even obtaining a license to build a reactor. And not to mention for a reactor design whose safety deficiencies have sparked concern at the U.S. Nuclear Regulatory Commission, as well as among nuclear safety regulators in France, Finland and the United Kingdom.

But those are exactly the question taxpayers, both in Maryland and across the country, should be asking.

Too many, especially in Congress (and we're looking right at you Steny Hoyer, who represents the Calvert Cliffs district), think that simply lending UniStar as much money as it wants to build Calvert Cliffs-3 will solve all these problems. But the problems are so deep-set that even if the government puts up $10 Billion or more, that will likely only temporarily salvage the project, which even Constellation Energy isn't yet committed to. Rather, the company wants the loan guarantee to buy it more time to examine whether a reactor even makes sense.

More likely, this reactor will never get built, and if the loan is granted taxpayers would be taking all of the risk for a company that is essentially an arm of the French government—hardly the kind of high-profile boondoogle a usually-cautious politician like Hoyer would seem to want to embrace or defend in a future election.

***Soaring Construction Costs.**

When Constellation Energy first began toying with the idea of building a new nuclear reactor, back in 2004-2005, it thought the cost would be about $2-$2.5 billion. Indeed, its application to the Nuclear Regulatory Commission to build the reactor, first filed in 2007 and updated five times since then, still uses a cost estimate in that range in its required NEPA cost-benefit analysis of a new reactor versus other sources of power. But even by 2006, Constellation knew it would cost more--by that point the utility was estimating $4.5 billion, and knew it

had to get some partners. It first teamed up with the French reactor manufacturer Areva (90%+ owned by the French government) and created UniStar Nuclear to further pursue the concept. Later in 2007, Areva and Constellation dropped their partnership and instead Electricite de France (80%+ owned by the French government), the world's largest electric utility, stepped in to fill the void. UniStar Nuclear Energy was born. In mid-2007, UniStar became the first utility in the U.S. to file a partial application for a construction/operating license for a new nuclear reactor in nearly 30 years.

By then, the cost estimate for this one reactor, which would produce about 1600 Megawatts of power, was about $7 billion.

In the summer of 2008, the Maryland Public Service Commission held hearings on the project. The Nuclear Information and Resource Service (NIRS) participated and brought in an expert witness to argue the reactor would be even more expensive than had to that point been stated. In rebuttal, UniStar CEO George Vanderheyden testified that their then-current cost estimates were "on the upper end" of $4500-6000/kw, or $7.2 Billion to $9.6 Billion.

Mr. Vanderheyden continues to hold to that estimate. But there is a catch. That estimate is for "overnight" construction costs, meaning that would be the cost if the reactor could somehow be built in a day. Of course, a reactor cannot be built in a day—it takes years—and financing and other costs add significantly to the final tally. One estimate that provides a clearer glimpse into actual costs is provided by Pennsylvania Power and Light, a UniStar partner, which estimates that actual construction costs, including financing and the initial load of necessary uranium fuel, would be on the order of $13-15 Billion for a reactor identical to Calvert Cliffs-3.

And these estimates are before a single shovelful of dirt has been turned over. The history of the U.S. nuclear construction program provides ample reason for concern: according to a 1986 Department of Energy study, the average construction cost overrun for the first 75 nuclear reactors built in the U.S. was 207%. The average overrun for the next 30 or so reactors was even higher.

UniStar, of course, knows this history, and thinks that either a) it can buck the odds and deliver a reactor on time and on budget and/or b) it doesn't matter because their economic model calls for taxpayers to take all of the risk.

Indeed, the parent companies are protected by no fewer than seven separate limited liability corporations between them and the actual reactor. Good luck to Uncle Sam ever figuring out how to recover lost money if UniStar doesn't repay its loans (the loans would come from the U.S. Treasury through the Federal Financing Bank, an entity more familiar with building college dorms than overseeing multi-billion dollar loans to private utilities). UniStar has apparently arranged for $2.9 Billion of its needed money to come from the French government's Export-Import Bank.

***Overreliance on government handouts.**

UniStar will not build this reactor without federal loans, and has said so since the beginning.

Calvert Cliffs-3 would be a merchant power plant, meaning that it would operate in a deregulated electricity marketplace, with no guaranteed purchasers of its power. If it were cheap to build and operate that might not be a problem; since it is neither, there is considerable skepticism about whether anyone would even buy its power.

The Maryland Public Service Commission conducted more than six months of hearings to ensure that Constellation Energy's subsidiary Baltimore Gas & Electric would be "fenced off" from Calvert Cliffs-3 and not be affected by conceivable cost overruns and problems at that project.

On the surface, BGE would seem to be the most likely buyer of Calvert Cliffs-3 electricity, but the hearings and the PSC's skepticism toward the project bode poorly for it taking a major role in buying electricity from the reactor (unlike its parent company, BGE is a regulated utility and would require PSC approval to buy electricity from Calvert Cliffs-3).

And if there are insufficient electricity sales, then UniStar might not be able to pay back the taxpayer loans it wants to obtain.

Back in 2007, Congress authorized the Department of Energy to give $18.5 Billion in loans for new nuclear reactors. At the time, Congress thought it was funding six new reactor projects.

But the skyrocketing costs of new reactor construction have changed the equation. Instead of six new projects, that money will now cover only two. The first money--$8.3 Billion, already has been allocated to a two-unit nuclear project in Georgia. The rest of the money will go to Calvert Cliffs or a different project, although Calvert Cliffs is generally regarded to be next in line. But in the Georgia project, the government is putting up only $8.3 billion for what is currently estimated to be a $14.4 billion cost. That kind of ratio won't work for Calvert Cliffs, which needs 100% financing, from U.S. and French taxpayers.

Why? Because UniStar was formed with essentially no money and with no assured customer base. The 50/50 split between Electricite de France (EDF) and Constellation Energy is predicated upon an agreement that EDF would put up a maximum of $625 million for initial costs and Constellation would throw in $49 million of unspecified assets (personnel, expertise, office space, etc.).

And UniStar apparently has already run threw nearly all of this money. That is a remarkable amount to spend before the company has even completed its license application (Revision 7 is due in October); is still in contested hearings over its application; does not have a certi-

fied reactor design (and because of design deficiencies, certification likely will be pushed back past 2012—see below), and has no potential customers while its projected costs just keep going up.

Indeed, Electricite de France on July 30 took a $1.4 billion provision against its $6.5 billion investment in Constellation Energy's nuclear program, including its $625 million investment in UniStar. The policy question is: Why should U.S. taxpayers be asked to provide loans to the French government to continue a project it thinks is fraught with risk? Said an EDF official, "The risk is high. There is a high probability we will have to depreciate maybe Constellation assets and maybe Unistar assets and risks, future costs of future development."

***Serious reactor design deficiencies**

The safety issues are significant. On July 22, 2010, the NRC wrote to Areva, the reactor's manufacturer, and said that deficiencies with the design's digital instrumentation and control systems have not yet been resolved. First identified by European regulators last year, the problem is that these critical systems may not work in accident conditions. The NRC warned that the already delayed certification of the design is likely to be delayed further. On August 4, Areva announced it would be March 2011 before it could provide the NRC with a proposed fix to the problems. More recently, French nuclear regulators ordered new changes to the system for the EPR already being built in Flamanville.

But another safety issue, brought to prominence in France earlier this year through EDF documents obtained by the anti-nuclear group Sortir du Nucleaire, is now being taken seriously by French regulators. While the issue is rather technical, the problem is that under certain scenarios, the reactor's automatic shutdown system could fail to operate, and radiation could be released to the environment. According to a top French nuclear regulator, in that circumstance "the released fission products will be more difficult to manage, more numerous." U.S. regulators have not, publicly at least, even begun investigating the issue.

Resolving these fundamental safety issues—if indeed they even can be resolved—will almost certainly push back the 2012 certification date for the Areva reactor design. And since UniStar cannot obtain a construction license until after the design has been certified, the company will have to make its dwindling cash reserves last even longer.

Meanwhile, Areva has taken billions of dollars in provisions for the first EPR under construction, in Finland, whose cost has now risen by about 80% and whose four-year construction schedule is now four years behind schedule. More unresolved safety concerns are likely to cascade not only over Calvert Cliffs, but also Areva's European and Chinese EPR projects (EDF is building an EPR in France, but announced last week that this project is two years behind schedule and about 30% overbudget).

***Falling electricity demand coupled with aggressive new state-level programs to further reduce electricity demand**

The recession caused electricity demand to plummet just about everywhere. For the first time since at least 1950, demand dropped two years in a row, and may have dropped three years straight. In the PJM service area, which includes Maryland, demand has still not returned—despite this summer's record-setting oppressive heat waves—to anywhere near its peak of 2006. That means that projections of capacity shortfalls made by the state just a few years ago no longer ring true; indeed there is plenty of excess capacity in the PJM region.

Meanwhile, in 2008, the Maryland legislature passed the EmPower Maryland Act, which has an aggressive goal of reducing overall electricity demand in the state by 10% and peak demand by 15% by 2015. These factors have had the combined effect of throwing past electricity demand forecasts out the window for utilities everywhere, but especially for UniStar which needs a very tight electricity market to be able to sell the 1600 Megawatts of electricity Calvert Cliffs-3 would produce.

***Meaningful and aggressive competition from renewables and other electricity sources**

When UniStar submitted its license application for Calvert Cliffs-3 in mid-2007, its analysis of possible alternatives to the project basically shrugged off renewable energy sources. The company didn't even acknowledge any possible role for offshore wind in potentially meeting Maryland's or the region's electricity needs.

But even by then, a company called Bluewater Wind was in neighboring Delaware seeking permission to build a several hundred megawatt wind farm a few miles offshore of Delaware's small Atlantic coastline. That permission has since been granted, and Bluewater has expanded its ambitions, proposing an even larger wind farm (600 MW) off the coast of Maryland (with the enthusiastic backing of Maryland Governor Martin O'Malley) and a large wind farm off the coast of New Jersey as well. The Department of Energy considers all three locations as among the best in the country for wind power potential and these projects quite likely will be completed and feeding power into the grid before Calvert Cliffs-3 could come online, further undercutting need for the massive reactor.

Bluewater was a fairly small company but last year it was purchased by the much larger NRG Energy. Ironically, NRG—which wants to build a two-unit nuclear facility at its South Texas location--and UniStar also are competitors for the remaining $10 billion in nuclear loan funds held by the Department of Energy. Unless Congress authorizes more funding for the program, only one of the two projects will get a federal loan.

Just as important as competition from Bluewater (and smaller renewable energy projects, including

solar power), is the plummeting price of natural gas. Gas is about a third of the cost it was just two summers ago, and most analysts believe its cost will stay low indefinitely. It is not difficult to conjure up a scenario where a company could come in to Maryland, build a large natural gas plant (which are much cheaper and faster to build than a nuclear reactor) and completely undercut UniStar's electricity prices in the deregulated marketplace, leaving UniStar to either sell its power at a loss or not sell its power at all. It's scenarios like that that must give UniStar executives nightmares.

***opposition from environmental opponents**

Contrary to popular belief and nuclear industry whining, interventions against license applications almost never stop nuclear projects. Only two major projects ever have been denied a license as a result of an intervention (Byron, near Chicago, in the early 1980s and Louisiana Energy Services uranium enrichment plant in 1998; Byron made some changes and got its license a few months later; LES picked up and moved to the more hospitable political climes of New Mexico).

Interventions, before a NRC Atomic Safety and Licensing Board (ASLB), are usually about seeking safety improvements, ensuring compliance with regulations and raising questions about nuclear operations in a formal public forum.

But in this case, environmentalists have raised an issue that is proving difficult for UniStar. The Atomic Energy Act, upon which all nuclear regulation is based, quite plainly prohibits "ownership, control or domination" of a U.S. nuclear project by foreign corporations or governments.

With the massive involvement of EDF, Areva, and the French Export-Import Bank in this project, that the issue is genuine is beyond question. Whether this large-scale foreign involvement actually violates the Atomic Energy Act will be up to the ASLB and possibly appeals courts to decide.

But everything UniStar and its partners have done has been with an eye toward this issue. That's why even though it put up more than 10 times the initial capital as Constellation, EDF only got a 50% share of UniStar. And when EDF bailed out Constellation, it paid $4.5 billion for *49.9%* of Constellation's five existing reactors, despite the fact that Warren Buffet thought the entire company was worth only $4.7 billion (Buffett had saved Constellation from bankruptcy in 2008, but Constellation spurned him when EDF's concern that Buffett would cancel UniStar led them to make their offer for Constellation's existing reactors). Again, they were concerned about going over an unclear "ownership, control and domination" limit.

In the end, UniStar simply overreached and adopted an economic model that borders on arrogance. The idea of a multi-billion dollar nuclear reactor being built with 100% debt financing—with taxpayers of two different countries taking the financial risk while a company protected by seven layers of Limited Liability Corporations would take all the profit—is not only capitalism run amok, it probably just won't fly, especially in a deregulated electricity market.

That UniStar has spent $600 million on the project doesn't undercut the 100% debt financing model—none of that money has been for reactor construction. And it hasn't been spent on reactor design either—that's being done by Areva, not UniStar. Rather, it's been spent (at least to the extent that it's clear what it's been spent on) on site-related work coupling the design to the site, hearings before Maryland Public Service Commission, putting together the initial license applications and subsequent five (so far) revisions, and who knows what else.

It's an astonishing amount of money to run through in three years, with little to show for. By contrast, it only took a little more than that ($766 million) to actually build *both* of the existing reactors at Calvert Cliffs. Even with inflation, the difference is striking. If gasoline had gone up at the same rate as nuclear construction costs, we'd be paying $20 for a gallon of gas.

The likely failure of Calvert Cliffs-3 calls into serious question not only the economic model of forcing taxpayers to pay for new reactors, but the concept of building and operating nuclear reactors in a deregulated electricity market. The risk may be just too great, and the potential rewards too speculative and uncertain, to enable such projects to succeed.

Fortunately, there are safer, cleaner and cheaper ways to get our electricity that are at the same time more effective and faster at reducing carbon emissions. A recent study by a Duke University professor, for example, found that solar power has crossed a historic point—it is, in North Carolina at least (which is a fairly average solar potential state) now cheaper than nuclear power.

A new study from DOE's National Renewable Energy Laboratory found that wind power offshore of Maryland alone could provide more than five times the power of Calvert Cliffs. With competition like that, and like Bluewater Wind and increasing energy efficiency, like low natural gas prices and no certainty of electricity sales, nuclear power just can't win—even if taxpayers are forced to take the risk the utilities themselves are unwilling to shoulder.

As Jay Hancock, a columnist for the *Baltimore Sun* who has been supportive of the Calvert Cliffs-3 project, put it on August 1 in a piece titled Prospects Dim for Third Calvert Cliffs Nuclear Unit, "The fact that Constellation stock goes down every time it looks like the plant will be approved suggests that even the people who own the company don't want it to happen."

Michael Mariotte, Executive Director
A longer version of this article first appeared in DailyKos, August 5, 2010 (http://www.dailykos.com/storyonly/2010/8/5/889695/-The-nuclear-renaissance-stalls-with-pending-collapse-of-Calvert-Cliffs). Links to references can be found there.